a journal for precision engineers and all users of industrial diamonds and other hard materials

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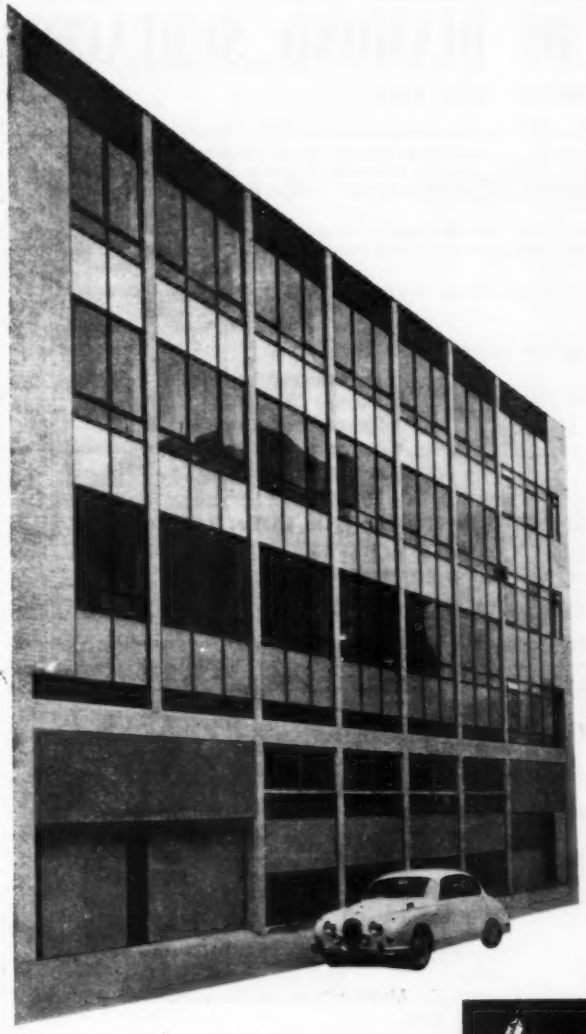

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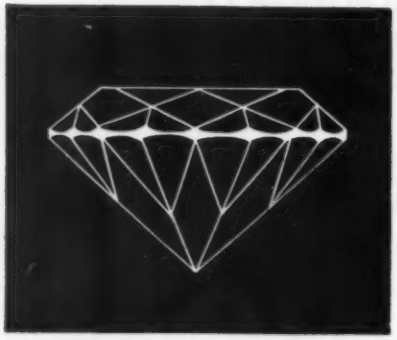

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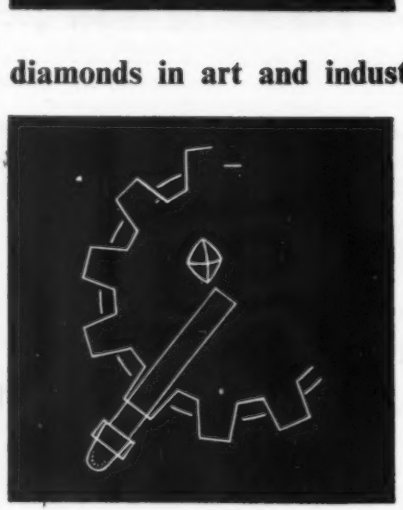

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INDUSTRIAL DIAMOND REVIEW

Vol 21 No 244
March 1961

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Generally Speaking

Action and Reaction

It is customary for editors of journals of all sorts to disclaim responsibility for the opinions of their correspondents and that is no less true of Industrial Diamond Review than of any other. It frequently happens that articles are submitted which are of general interest and of importance in themselves, but which contain statements or opinions with which the editor cannot agree. It would obviously be a mistaken policy to deny such articles publication at all, simply on account of a difference of opinion or a different interpretation of facts. The very fact that an article is in some sense controversial in many ways adds to its interest and such differences of opinion may very well lead to interesting correspondence provoked in such a way. If we ever publish matter with which any of our readers do not agree, we sincerely hope that they will write and tell us so, and we should be delighted if such differences produced an article refuting the statements originally made. Unless there is any very good reason against it, we will publish such a sequel, giving equal prominence to that enjoyed by the original article.

Trade Information

The May issue of Industrial Diamond Review and Industrial Diamond Abstracts will be largely devoted to reviews and advance information of trade fairs and reviews of trade literature of current interest to our readers.

ADAMANT.

Application of Industrial Diamonds II

by

H. J. Otterloo

Determining the Size of Grain

In our previous article we gave a general view of the factors which play an important part in the choice of diamonds for industrial purposes and especially for the diamond grinding wheel. We remarked that the concentration in the case of the diamond grinding wheel is a factor which is hard to define and that this must be regarded as a matter of trust vis-à-vis the supplier. The bond of the grinding wheel and its sintering have been discussed in detail.

In considering grain size we must define ' mesh ' and ' micron.' These different terms may at times lead to difficulties. In the English-speaking countries the term ' mesh ' is used exclusively;* and ' micron ' in Western Europe. As stated previously, ' mesh ' is determined by the number of meshes in the sieve per linear inch; the ' micron ' indicates the size of the mesh width. It may be regarded as generally known that the very fine grains are obtained by the elutriation method. In the table below (Table I) we give a survey of the ' mesh ' and ' micron ' definitions with their comparative values.

The size of grain is, as in the case of normal cutting/polishing media, like corundum and silicon carbide, an important factor which can greatly influence the surface quality of the finished surface.

Comparison Table of diamond grain sizes

CS 123-49 No.	Grain size μ	BSI mesh	NBS mesh	DIN-848 grain size in μ	
1/4	0-0.5			D 07	0.5- 1
1/2	0-1			D 1	1 - 2
1	0-2			D 3	2 - 5
3	1-5				
6	4-8			D 7	5 - 10
9	6-12				
15	8-22			D 15	10 - 20
30	20-40			D 30	20 - 30
40	30-50				
50	40-60				
	Width of mesh opening μ				Width of mesh opening μ
74	43-60		230-325	D 50	40 - 60
	53-66	240-300			
	66-75	200-240			
	60-75		200-230	D 70	60 - 80
106	60-90		170-230		
	75-90	170-200	170-200		
	90-105	150-170	140-170	D 100	80 -120
150	90-125	120-150	120-170		
	105-125	100-120	120-140		
193	125-150	85-100	100-120		
230	150-175	72-85	80-100	D 150	120 -200
302	175-210	52-72	70-80		
	210-300	36-52	50-70	D 250	200 -300
	300-425	30-44	40-50	D 350	300 -400
	350-500	25-36	35-45		
	425-600		30-40	D 500	400 -600

1 μ (micron) = 0.001 mm

CS 123-49 = Commercial Standard CS 123-49 Washington
BSI = Imperial Standard = British Standard Institution BS 410
NBS = National Bureau of Standards, Washington = ASTM (American Society for Testing Materials)

* This is not wholly true: micron measurements are used for the smaller sizes of grit everywhere. Ed.

We will take no account here of the fact that working with the grinding wheel 'open' or 'closed' can also greatly affect the surface quality. Generally it can be said to be true that hard metal, after preliminary working with silicon carbide, should be ground with a diamond grinding wheel, and then lapped with an even finer wheel. This can be done very easily, for on most good grinding machines for hard metals, a diamond wheel can be mounted both on the left and on the right. Prolonged and detailed tests on the ground cutting faces have shown that superfine surface quality has only a relative value for a cutting edge. Especially in the case of heavy chip production of various kinds of steel the cutting face of the tool is quickly affected by the roughness of the chip which has to be removed. As may be assumed to be known, this chip is removed a little behind the edge and tends to hollow it out, but the actual point touching the workpiece is also subject to wear. For the working of non-ferrous and synthetic materials, and for precision turning, final lapping of the hard metal tip may offer certain advantages both in the surface quality and the life of the tool. As stated previously, prolonged tests in a large concern, over the course of years, have shown that all tools may be ground with a diamond grinding wheel with grain size D 70 or 200 to 240 mesh. Thus both preliminary and final grinding can be done with this kind of wheel, and the surface quality of the ground face can be considered to be satisfactory, both in meeting set surface requirements of the surface to be worked and in attaining a given tool life.

It is important that the users of diamond wheels should take this into consideration as it becomes much simpler for the organization of the trade and grinding in general when one single grain size may be used in practice, but if a lapped tool bit is required, for specific polishing tasks, a grain size of 300 to 400 mesh can be applied. Its use should be strictly limited however.

Pre-grinding of hard metal with silicon carbide

As it is the aim of this series of articles to make the use of diamond grinding wheels for the working of hard metal as extensive as possible and all these details have been tested in practice, we want also to deal briefly with the right silicon carbide stones to be considered for the purpose. In tool manufacturing firms where diamond grinding wheels are used almost exclusively for the maintenance or manufacture of cutting tools and whatever other hard metal grinding has to be done, more hard metal will have to be removed in many cases than makes the use of diamond grinding wheels economically justifiable. Extensive tests have shown that grinding hard metal with silicon carbide cannot achieve microscopically fine finish. The stock removal capacity of these wheels is, however, quite high, as however is also the wear. But as the cost compared with the diamond grinding wheel is much lower, this wear factor is unimportant. For hard metal cutting tools and other tools, pre-grinding with silicon carbide is therefore necessary in many cases.

Another advantage of grinding with silicon carbide is, that it may also be used to grind the shank material of the tools.

We will not deal in detail here with the so-called 'S' tools, by means of which shank material may be ground. In these grinding tools a single layer of diamonds is fitted in such a way that all grains are pointed outwards. Their grinding capacity is very great and can in certain cases offer advantages. A disadvantage, not to be underestimated, is that with the slightest vibration of workpiece or machine, as well as with a too rough start, the entire mounted layer of diamonds suddenly disappears. But in such cases, where the grinding of hard metal and shank material are unavoidable, these types of diamond grinding tools offer a way out and there is no need to grind with silicon carbide. In Fig 1, we have shown a silicon carbide cup

Fig 1 *Fig 2* *Fig 3* *Fig 4*

Varieties of grinding wheels.

Fig 1 (left). Flaring cup wheel.

Fig 2 (left centre). Peripheral wheel.

Fig 3 (right centre). Peripheral wheel (centreless grinders).

Fig 4 (right). Straight cup wheel.

wheel, which can be used quite universally on the tool grinding machine. On the same machine the grinding wheel of Fig 2 can be used successfully for grinding circular or small surfaces. For universal cylindrical grinding machines, the wheel in Fig 3 is used. For vertical spindle machines used for general grinding purposes, the cup grinding wheel of Fig 4 comes into account. This is preferably set up beside the diamond grinding machine, so that immediately after pre-grinding with silicon carbide, the diamond grinding wheel may be used. The tests for the determination of the exact grain size and shape of the silicon carbide wheels for pre-grinding were carried out with the Norton make and it was found that 39C 60 J8 Vk gave the best results. For finer pre-grinding operations grain 100 can be applied. The symbols may be interpreted as follows:

39C—number and type of grinding material (Crystolon) chosen by the manufacturer;
J —hardness;
8 —structure, open or closed, runs from 0 to 12 inclusive;
V —vitrified or ceramic bond;
K —special porous bond.

Spray lubrication when grinding with diamond wheels

If the highest return is to be obtained when grinding with diamond grinding wheels, in the working of hard metal, a coolant must be applied. This prevents excessive heating of the grinding area, causing small cracks to appear that can afterwards lead to complete breakage of the tip, or to premature breakdown of the cutting edges. Another important factor for the cooling or lubrication during grinding is that the diamond grinding wheel is kept 'open.' It must be quite clear that, if the space between the grains is filled up with removed material, the cutting capacity of the grinding wheel must decrease considerably. But we must assume that this is sufficiently well known and we will not go any further into the matter. In the case of tool grinders in general this problem has been quite satisfactorily solved. A circulation pump is attached which can ensure sufficient circulation of the required coolant. Moreover, it may be directed to the best place immediately on the tool surface and impregnated section. As it is possible to screen off these machines satisfactorily, the attendant worker is not hindered, certainly not in observation during grinding. On the universal grinding machine, it is a quite different matter, however. No abundant supply of coolant can be applied here as the machine has not been built for this. The supplied coolants flow all over the machine and not only make a mess, but also make observation of the workpieces very difficult, so that errors are unavoidable. In order to avoid dry grinding, so-called wicks have been brought into use, which rest flush against the impregnated section of the diamond wheel and are fed from a reservoir, thus keeping the impregnated surface moist.

This quite widely-used and old method has not only the disadvantage that the machine is still in a rather wet and dirty condition but also the grinding wheel suffers from over wetting, while the ground material is picked up by the felt piece and is pressed during grinding into the pores of the wheel surface. Cleaning and changing the pieces of felt has proved to be quite insufficient. The result of all these methods —to say nothing of lubrication with a brush— is sufficient inducement for the operators not to cool at all, or as little as possible, which must naturally happen at the expense of the costly diamond grinding wheels, to say nothing of the increased grinding time. To solve this problem also, research has been undertaken and tests applied, which have led to a quite general application of spray lubrication. The well known 'Enots' pneumatic servicing apparatus can offer excellent services here. An oil spray lubricator Ac 291 B and a reducing valve Ac 164 are required as main constituents. The purpose of spray lubrication, as implied by the name, is to apply the coolant in a mist to the exact place where it is required. Normal pressure (1 to 2 atm suffices) is connected to the reducing valve, while the coolant is introduced into the oil spray lubricator. In connection with this coolant it should be stated that the well known 'Diamoil' has proved to be a particularly good coolant and lubricating medium for grinding hard metal with diamond grinding wheels. It serves to keep the wheels 'open,' lubricated and cooled in a special way. The medium is wholly odourless and non-toxic. The use of paraffin must be discouraged as much as possible, as its

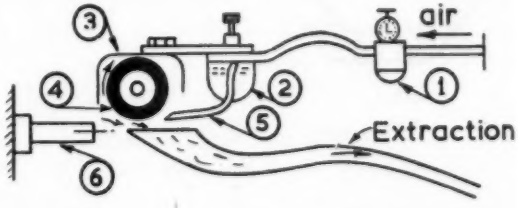

Fig 5. Schematic lay-out for mist lubrication. (low level extraction)

cleansing capacity is quite insufficient. The new coolant ' Ultralin ' has also very good qualities. In Fig 5 we have indicated schematically how the spray lubrication mist is applied. When the air is introduced, the reducing valve 1 (ac 164) is connected and then the oil spray lubricator (Ac 291 B). The diamond grinding wheel 4, mounted on the axle of the grinding spindle of the universal tool grinding machine, is provided with an extra guard in order to prevent the mist from being sprayed over everything. By means of the special tube 5, the spray is directed on to the wheel surface and the workpiece to be polished. The latter 6, *e.g.* a milling cutter, or similar tool, now protrudes sufficiently from the dividing headstock, so that the supplied mist can be drained away without difficulty by drainage tube 7. When the workpiece is brought too close to the dividing headstock, the mist is directed against the headstock, which means that it is wasted and may hinder the worker. Should this be the case, the mist is drawn away upwards (see Fig 6). Once the oil lubricating apparatus is in position, mounting becomes quite a simple matter. Several machines can even be supplied by it. If necessary, a changeover to another machine may be effected quickly. All that has to be fitted by this method are the supply tubes 5 and the outlet tubes. This is, however, quite a simple matter which can even be carried out by the operators. Once sufficient accessories are available, the question of exchange is simple.

The method of cooling and lubricating offers many advantages, not only by an increased output of the diamond grinding wheel, but also by the fact that the grinders work with more satisfaction, because now even special tools can be ground with coolant, without the machines, and thereby also the workmen, getting covered in the fluid.

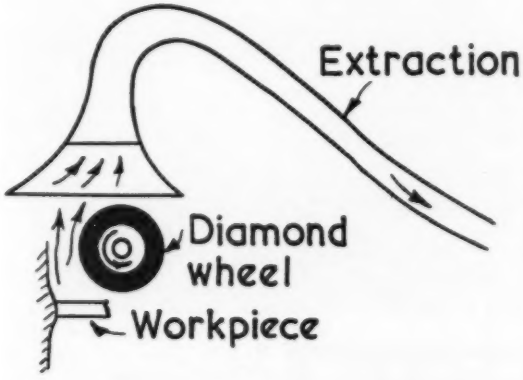

Fig 6. Schematic lay-out for mist lubrication. (high level extraction)

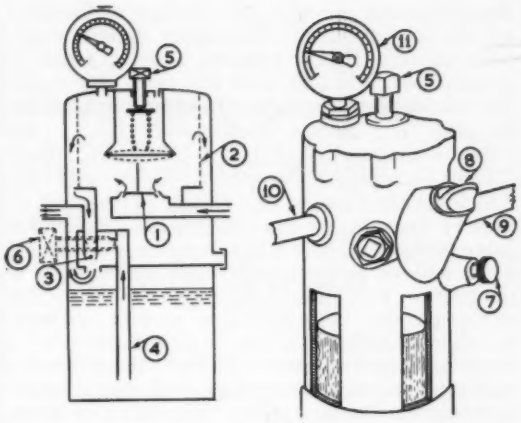

Fig 7 and 8. Layout of the SKF Spray Lubricator.
Fig 7. Schematic diagram.
Fig 8. General view.

The subject would be incomplete if we did not mention the SKF spray lubricator, which is used in the same manner as the described Enots type, the only difference being that only one apparatus is required that can simply be mounted with a clamp to the head of the universal tool grinding machine. In Fig 7 a schematic section is given and in Fig 8 the view in perspective. Like the previously discussed type, this apparatus can also be adjusted very accurately according to the quantity of mist required, for a given workpiece. In Fig 7, the regulating valve is 1, the airfilter 2, the spray attachment 3, the intake tube for the Diamoil 4, the pressure adjustment screw 5, the regulating screw 6, and the drainage tap for possible condensed water 7.

In Fig 8 the intake duct for the Diamoil 8 is plainly visible, as well as the supply of air 9. The supply duct to the diamond wheel is 10, and 11 is the pressure meter from which may be read the exact pressure for air regulation. We have discussed spray lubrication at some length as this is most important. We can make a good choice of diamond wheel and select a first-class machine, but if the mentioned accessories are not used, the best output will not be achieved.

Measurement of surface roughness

The surface accuracy of the polished cutting face and the workpieces which are turned, milled, sharpened, etc., are generally difficult to define in practice. As the subjects we have discussed are closely connected with roughness

determination, we will give a short explanation of the subject here. The visual determination of a surface always remains a great point of controversy, however great the skill. Expensive laboratory instruments are likewise no solution, as with the Abbot Profilometer (U.S.), the 'Brush-Analyser' (U.S.), the 'Talysurf' (Brit), 'The Tomlinson Describer' (Brit), and the 'Lichtschnitt-Pruefgeraet' (Jena). These are no factory instruments but are intended rather for laboratories.* The Philips roughness meter PR 9150 will be subject to a brief explanation in connection with the general roughness definition. Although this does not give precise readings, it offers a sufficiently practical indication of a given surface roughness. In Fig 9 is indicated a registered surface, whereby L-L is the theoretically perfect line or surface. In order to indicate the degree of roughness to be measured, an international unit would be desired in this connection, but this is unfortunately not the case. In three leading countries the degree of roughness is defined in three different ways:

(a) the maximum difference in height between the highest and the lowest points. H_{max}, upon which the German standard DIN 4762 is based, is usually expressed in micron (μ):

Fig 9. Surface for roughness testing (Line L/L is the theoretical perfectly smooth surface).

(b) the effective roughness height (h_{eff} or h_{rms}) which is the square root of the arithmetical mean of the squared deviations h vis-à-vis the zero-line L, measured over a given distance:

$$h_{eff} = \sqrt{\frac{h_1^2 + h_2^2 + h_3^2 + \ldots\ldots h_n^2}{n}}$$

On the effective value is based the American standard ASA B 46; h_{rms} is given in micro-inches (μ");

(c) the mean roughness height (h_{gem}), which is the arithmetical mean of the absolute value of the deviations vis-à-vis the zero line, measured over a given length:

$$h_{gem} = \frac{h_1 + h_2 + h_3 + \ldots\ldots h_n}{n}$$

The English standard BS 1134 is based upon the mean roughness height which is called in England 'centre line average' (CLA).

Like h_{rms}, CLA is expressed in micro-inches. As international symbols for the above mentioned roughness standards the following are recommended:

R_t : maximum roughness height (H_{max})
R_q : effective roughness height (h_{rms})
R_a : mean roughness height (h_{gem} or CLA).

Holland too has been occupied with the roughness indication in V 630, with this problem, and has accepted the Ru. Here the following applies: ru = 0.025 micron = 1 micro-inch.

Without entering into further details it should be observed that the indication μ beside μ" in connection with the dimension value can lead to difficulties in international use.

Philips roughness measurement apparatus

Although there are several instruments on the market to determine surface roughness in factories, we wish to deal briefly with this type. In Fig 10 we see how a tracer R rests upon the surface. A second needle S, the tracing needle with a rounding off radius of 60 μ explores the roughness profile to the deepest point. This tracing needle S is attached to the end of the piezo-electric element P (barium titanate, heat- and moisture-proof) that is attached at the other end in the body of the meter. When probing the surface to be measured, the dipping of the element varies according to the unevenness in the surface and the pick-up communicates a corresponding tension/voltage which is intensified and measured by the apparatus PR 9150 (Fig 11). The height and width of the tracer are such, that even a hole of 8 mm diameter can be measured. The apparatus is supplied with correctly measured roughness gauge specimens that have a hard layer of chromium, and depend-

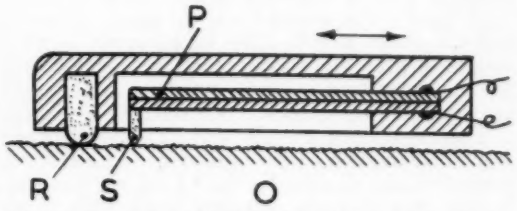

Fig 10. Tracer head of the Philips equipment (section).

* We do not agree with our correspondent's opinion here. These instruments are in fact in use in thousands of factories all over the world. Ed.

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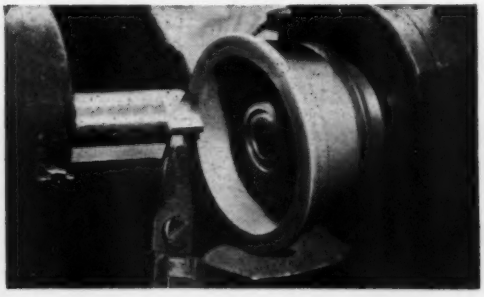
"We get more jobs out of each wheel with these" says **Tom Swain**

Tom Swain is the charge-hand of the cutter-grinding shop of Jonas & Colver (Tools) Limited. Most of the tools they grind there go to the motor industry or the aircraft industry. Among the most successful production tools that Tom's men use are the resin-bonded diamond wheels made by CARBORUNDUM shown in our smaller illustration. 'We find we get more jobs out of each wheel with these.' Tom says, 'And that's important with diamond wheels. Diamonds cost money!' He might have added that long wheel-life saves time spent in wheel changing, and so increases the production rate — not a big increase, but worth something in the course of a year.



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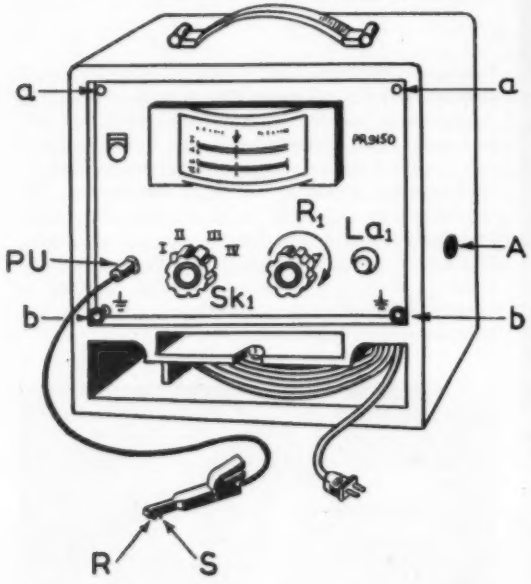
ing upon the frequency of use, have quite a long life.

Further explanation of this apparatus is impossible in the scope of this article, and we should only point out, in addition, that the sensing head is held between the thumb and the first finger, as shown in Fig 12. One must only take care that during the movement of the feeler across the surface to be measured, the

Fig 11 (below). General lay-out for the complete Philips model PR 9150 roughness testing equipment.



tracing needle R and the sapphire S always glide together across the surface (see also Fig 13). The tracing direction is parallel to the surface and perpendicular upon the grooves. The work speed has been set at 4-8 cm/sec for a reasonably fair indication. The operator must have the experience needed for this apparatus as indeed he must for all measuring instruments.

Surface roughness and tool wear

As we have already observed, the surface roughness of a cutting point or face is quite relative in each case. In Fig 14 A, B, C and D, we see the point accurately polished and lapped. After a working time of 30 minutes, the point is worn away to the extent shown in the shaded part. This shows clearly that not much is left of the original tip. Obviously this also affects the worked surface, but with heavier cutting it happens only occasionally in practice that

Fig 12 (above). How to hold the tracing head of the Philips roughness testing equipment.

Fig 13 (below). Checking of tracer head on the surface roughness standards provided.

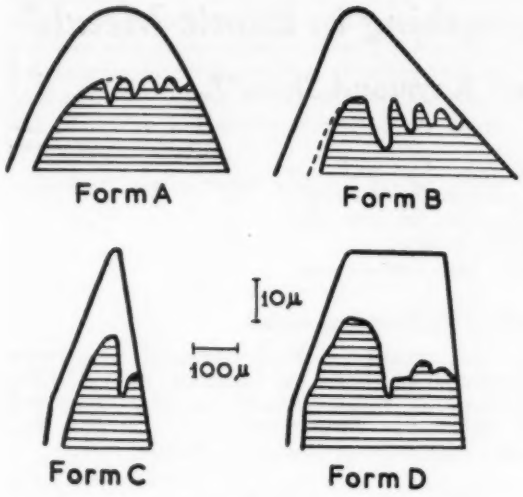


Fig 14. Various shapes of form tools with wear after extensive use.

high surface accuracy is required. Moreover, the working life of the tool must be considered in relation to this. Where higher demands are made on surface finish other working methods will also have to be used in production, *e.g.* polishing. It has been the purpose of the tests undertaken to show that the very accurately lapped tool has only a relative value, which thus confirms what has been proved in practice: that in practice a diamond grain size D 70/200/241 mesh is generally sufficient. Here we gladly join with Dingler who has made these tests and has come to the final conclusion that research into surface quality of a cutting tool is far from concluded, and many more tests and research operations will be necessary before we are able to determine the surface roughness of the tool for a given tool life and surface accuracy. Account must hereby also be taken of a great many factors which may affect the final results.

In a later article we shall be discussing in greater detail synthetic diamonds vis-à-vis natural diamond in diamond grinding wheels, and truing diamonds.

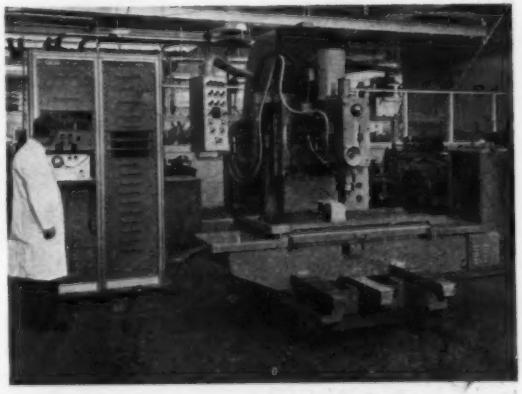
Vertical Miller That Thinks Ahead

by a Special Correspondent

An automatically controlled vertical milling machine which can detect any irregularity or error in the tape and stops the machine before the workpiece is damaged was demonstrated recently by E.M.I. Electronics Ltd, of Hayes, Middlesex.

Previously tape-controlled machines were equipped with a safety system which stopped the machine immediately an error was made. The advantage of the new system, known as the Emicon, is that should a fault occur near the end of a programme in which the work may have a complicated profile, a large saving is made by eliminating the scrapping of a valuable workpiece.

The machine used in the demonstration was a Droop & Rein FS 80 N general purpose model particularly suitable for large die sinking. It was the first electronically controlled machine to be manufactured by the company.



The Droop & Rein vertical miller supplied by Elgar Machine Tool Co Ltd with the electronic control cabinet on left.

*Economical, Accurate Hole-making in Exotic Metals**

*by W. H. Hampton and Raymond Shaw***

New diamond-impregnated core bits and compatible drill presses make accurate hole-making in any metal economically feasible for any shop, eliminate secondary finishing.

In the first major test of making holes in tungsten carbide with a new diamond impregnated coring tool, hole drilling expense dropped from a total of about $80.— to a minimal $1.20. Such a result, even if liberally discounted as preliminary, forecasts a new era in working the ' exotic ' hard metals.

Lack of practical, precise and economical method for coring these space age materials at a production level has been one of the major obstacles in the way of their wider acceptance. The cost of these methods is relatively high. At times they damage or change the character of material adjoining the hole.

Fig 1. Coring exotic metal with diamond-impregnated bit on Buffalo drill press.

* Reprinted with kind permission from *Grinding and Finishing* 1961 pp 38-39 (Jan).

** Hoffman Bros Drilling Co.

Research Programme started

This situation sparked a research programme initiated in 1956 by Hoffman Bros Drilling Company, Punxsutawney, Pa., and completed jointly with Kennametal, Inc., Latrobe, Pa., and Buffalo Forge Company, Buffalo, N.Y.

Its results have been the development of a complete new line of Hoffman diamond impregnated core bits, trademarked Metoram, and of a new No 18 Buffalo drill press which meets the requirements of the operation for high speed, accuracy, and rigidity. The press was designed to incorporate the advantages of accurately controlled fluid and static pressures with the use of a hollow spindle.

All of the core drilling test results reported below are based on the performance of Hoffman Metoram bits used with No 18 Buffalo drill presses.

Drilling costs reduced

Succeeding tests confirmed the preliminary findings. On one sample of K-164B tungsten carbide, 51 in. were drilled for a total outlay—including labour, materials, and overhead—of less than $1.— per inch, compared with a previous $16.—. Typical reductions on other materials per inch drilled are the following:

Material	From	To
Fired silicon carbide	$2.85	83 Cents
Beryllium oxide	70C	25 ,,
High density aluminium oxide	74C	26 ,,
Sintered barium and iron oxide	81C	30 ,,

Full test results of coring a number of other extremely hard metals and metallic materials with density characteristics similar to tungsten carbide are not included, but are available on proper request.

The performance of Metoram bits is such that secondary lapping or finish grinding has

been eliminated in many cases. On all materials tested to date, drilling time has been considerably less than with other coring methods, and accurate hole size can be predetermined. Finally, Hoffman Metoram bits permit coring at regulated speeds and pressures that eliminate damage or change to the work material.

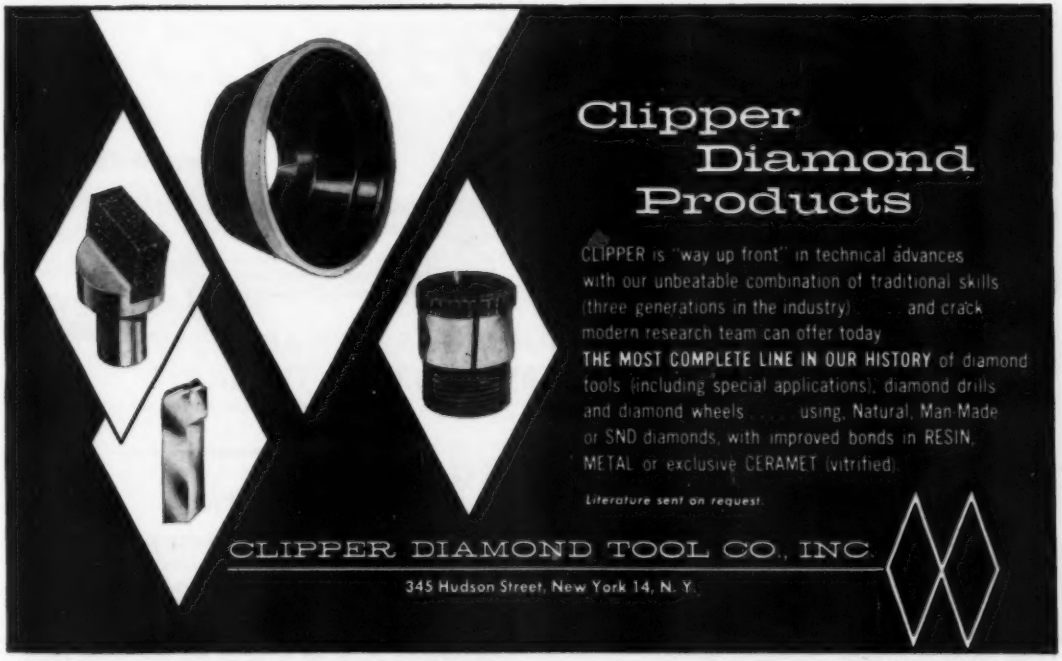
Verified performance records of the coring efficiency of Hoffman Metoram core bits in eight different known grades of carbides are shown in Table A. Carbides for these tests were furnished by Kennametal, Inc, of Latrobe, Pa., and actual drilling was conducted under the joint supervision of Hoffman and Kennametal. A Metoram bit having an outside diameter of 0.388 in. was used in each instance to insure an accurate comparison.

Table A

Test Results Coring Carbides with Metoram Bits

Product Grade	Rockwell 'A' Scale	Thickness of Drilled Pieces in.	Metoram Drilling Time Min	Sec	Est Conventional Drilling Time
*K — 164	84 — 84.5	1 1/16	2	48	
K — 90	85 — 85.5	1 1/16	8	04	Regardless of type of tungsten carbide material, time to produce a hole, 3/8 in. dia through 1 1/16 in. thick material is from 20 to 80 minutes depending upon type of equipment being used.
K — 92	88 — 89	1 1/16	4	34	
K — 1	89.6 — 90.1	1 1/16	1	44	
K — 94	89.6 — 90.1	1 1/16	2	04	
K — 84	90.7 — 91.2	1 1/16	2	48	
K M	90.7 — 91.2	1 1/16	5	28	
K — 6	91.8 — 92.3	1 1/16	0	56	

* Drilling speed for the K — 164B was 4200 rpm. All other grades were drilled at 3725 rpm which is rated according to the spindle speed. Water at 75 psi fluid pressure and 85 psi static pressure was used as the flushing and cooling agent. The feed was regulated by hand, using only sufficient down pressure to maintain contact between the face of the Metoram bit and the piece being drilled.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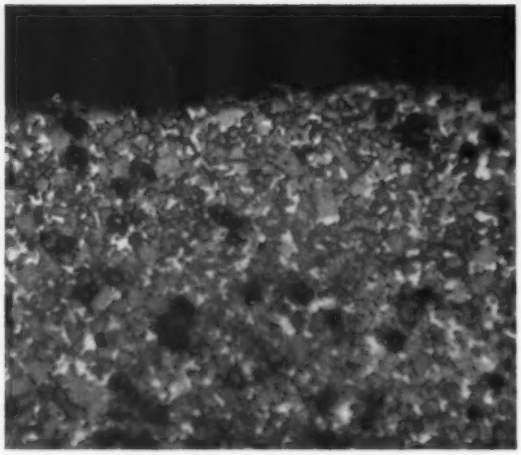

Fig 2. Unretouched photomicrograph of K-1 tungsten carbide sample sectioned lengthwise through hole. 1,500 ×. Structure normal for K-1, shows no cracking as a result of the drilling. Edge of hole across top.

Sidelight data on the tests reinforce the basic conclusions. On the K-164B sample, 51 in. of material were cored with a single bit before tool life and gauge were exhausted. The outer diameter of the bit was reduced only from 0.388 in. to 0.384 in. Drilling time per unit on the same sample did not vary more than 19 seconds during the entire bit life. On the K-92 sample 26 in. of material were cored before the bit was consumed.

Early test results indicated that the programme would meet its objectives of comparatively low drilling costs combined with the obvious advantage of greater flexibility in the placement of holes. Metoram bits produced a 32 r.m.s. finish on the first pass without need for secondary lapping. Further experimentation showed that finishes from 18 to 32 r.m.s. could be obtained simply by increasing the rev/min and the fluid pressure.

No material damage

Microscopic and photographic examination of the drilled pieces showed no damage or deterioration to any of the carbide samples. Reporting on these results, E. N. Smith, technical director of Kennametal, had this to say:

'A Penetrex inspection of each piece showed no evidence of cracks in any of the samples. Sectioning was done parallel to the long axis of the hole and the area immediately adjacent to the hole was examined metallographically.

'There was no evidence of breakdown of the surfaces or change in structure. It is concluded that the method of drilling tungsten carbide with diamond impregnated core bits is a safe and practicable way to place holes in sintered carbide pieces.'

Impressed by the results of preliminary research, one of the country's leading tungsten carbide users conducted independent drilling tests on their own grades of carbides. Results caused them to convert from previous carbide drilling methods to the use of Metoram bits.

In reporting the test results, the company gave these reasons for the change:

(1) Greater exactness in hole location,
(2) No deterioration of product during drilling,
(3) Less time required for finishing to exact size,
(4) Speed of location of hole, *i.e.*, minutes vs hours in creating desired hole.

These results from independent tests confirm the conclusions from the four-year test programme. They indicate that accurate coring of any material, no matter how hard, can be both practical and economical for even the smallest shops.

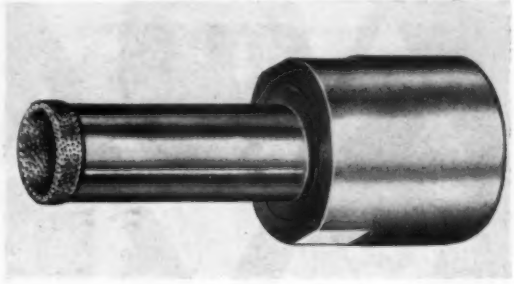

Fig 3. A Metoram coring bit.

CORRECTION

We wish to apologize to our readers for an unfortunate error which occurred in the review of Sir Gordon Sutherland's discourse to the Royal Institution on February 10. The date given for Maskelyne's discourse should have been 1860 and not 1960 as given on p 37 of the February issue.

Grinding and Polishing Tools made of Natural and Synthetic Diamonds

*by Senator h.c. B. Kleinschmidt**

Hardness and durability are the properties that make the diamond so valuable as a tool (working diamond). A distinction is made between crystalline and amorphous (shapeless) diamonds. Industrial diamonds (boarts) belong to the crystalline, and carbons to the amorphous group (found mainly in Brazil and some South African mines). The diamonds are used in rough or broken form, or they are individually polished as cutting tools. Ballas is a polycrystalline form in which the crystals are arranged radially, and these diamonds are used mainly in truing tools and drill bits.

The qualities which cannot be used as gemstones are known today as boart. Large quantities of diamonds occur which show no regular crystal form and are not perfect as regards colour. Occasionally these stones can still be used for truing tools and in drill bits and stone sawing blades. The majority is turned into diamond powder, however. Industrial diamonds, which were formerly a by-product of diamond mining, have today attained supreme importance; and indeed they have achieved a far greater economical significance than gemstones through their varied uses in industry.

Diamond wheels containing natural diamond have been produced by the German grinding material industry for many years, and they have only a very thin layer of diamonds. If it had been possible to produce diamonds in very large quantities and at very low prices, that is, to make grinding wheels entirely of diamonds, this would have started a revolution in grinding. Unfortunately this problem is not yet resolved even today. It is true that we can now produce diamonds synthetically, but we cannot yet produce very great quantities and we can do it only at very high cost.

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As far as the technical uses of diamonds are concerned, the selection of the rough stones is a very important preliminary task. For the sorting of diamonds there are no universally valid guiding principles. The diamond trade and diamond industry have their own classification. In general, the choice of diamonds is determined by the manufacturer of the diamond tools. Fine grinding, lapping and polishing are the most common applications of the diamond in industry.

The first synthetic diamonds were produced in 1955, and continuous production was begun in 1957. Manufacturers of diamond grinding wheels have in the meantime carried out many experiments in the laboratory and in practice, which have shown that the new diamonds, known as M M diamonds (Man Made diamonds) are superior to the natural diamond for certain applications. Tests made by German grinding wheel manufacturers have shown that resinoid-bonded grinding wheels containing synthetic diamond achieve more than wheels containing natural diamond, the wheel having the same diamond concentration. The General Electric Co claims that bakelite-bonded grinding wheels containing synthetic diamond achieve up to 100% more, and on the average 35% more, than grinding wheels containing natural diamond.

Grinding wheels containing synthetic diamond have, among other things, sharper cutting edges, thereby requiring less power; grinding can be done more quickly, and they have a longer tool life.

The grinding wheels made of synthetic diamond have shown that their greatest capabilities lie in grinding sintered carbides. Now there are few fields in the technology of grinding that are as diverse and complex as the grinding of sintered carbides. There can be no standard grinding wheel that is the best for all fields; for the kinds of tools to be ground, the grinding machine, the preliminary treatment of the tool, the requirements concerning quality and grinding time, vary considerably for each industry. This can only be done, however, with the co-operation of the producer or supplier and the consumer, as this last person must give all the particulars required by the manufacturer.

Figure 1 shows on the left natural diamond particles, and on the right synthetic diamond particles, both magnified 400 times. The tool life of diamond grinding wheel is decisively influenced by the grinding pressure. And for diamond grinding wheels, just as for ordinary wheels, the capabilities of the wheel depend on the operator. A skilled experienced operator, who has the necessary sensitivity, will achieve good results with normal diamond grinding wheels. But where industries lack suitably trained men, wheel use is generally found to be poor. And if an attempt is made to reduce wheel wear by the use of harder kinds of bond, then this is at the expense of grinding time and quality, so that it does not become more economical.

The grinding feed is mechanically regulated for the grinding of rotating tools, such as cutter heads, etc, and the grinding pressure cannot be controlled. The result is bad exploitation of the diamond wheel. And it often happens that bad spindle bearings are the cause of a shorter working life of the diamond grinding wheel.

By means of the Elastik diamond grinding wheel illustrated in Fig 2, the grinding pressure is automatically regulated to a great extent. Premature deforming through uneven load on the grinding area is largely avoided. It is easier for the operator to make better use of the diamond wheel in fine hand grinding. The forming of grooves on the grinding wheel during

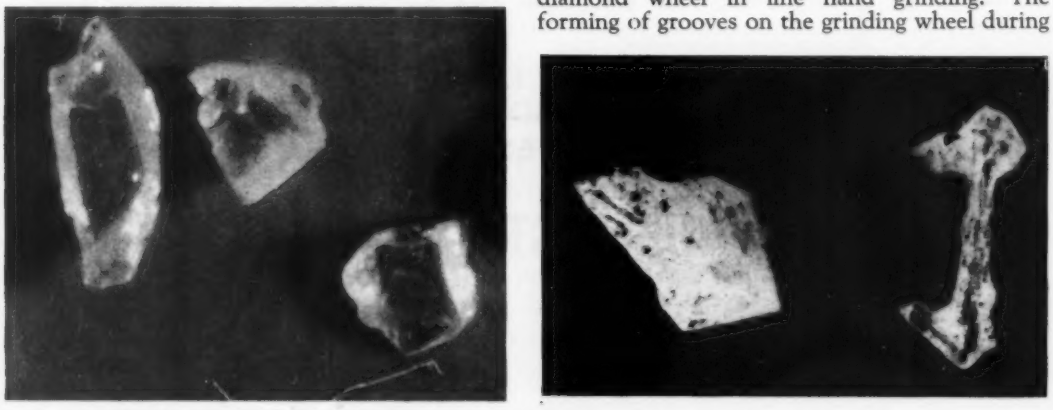

Fig 1. Natural diamond particles and synthetic diamond particles, magnified four hundred times.

radius grinding, which in most industries is done by off-hand grinding is avoided. Mechanically regulated feed evens out the grinding pressure, and imperfections caused by inadequate spindle bearings are intercepted directly at the point of contact.

The Elastik diamond grinding wheel illustrated is very handy and produces a good finish. An important feature of this design is a resilient plastic jointing between a light metal body centre and the actual grinding wheel with the grinding layer. The construction is quite shock resistant and needs no attention or regulation. This diamond wheel is not to be equated with the familiar mechanically sprung grinding wheels.

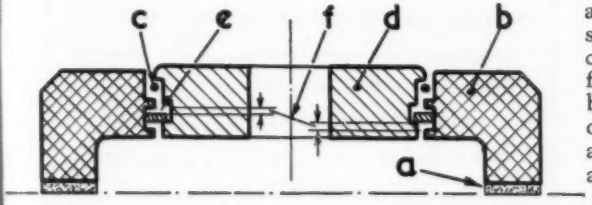

Fig 2. (a) Diamond impregnated layer, (b) body rim, (c) O-ring, (d) body centre (metal); (e) retaining circlip; (f) limits of elasticity (max 0.5).

On the whole the tool life and performance of the diamond grinding wheel depend on its correct use and proper maintenance. The grinding machine must be of the most robust and non-vibratory construction possible, and the spindle must run freely. In peripheral grinding out-of-trueness of the wheel should not exceed 0.01 mm, and in lateral grinding 0.02 mm. For tools with multiple cutting edges, such as reamers, cutter heads, sinkers, etc, the grinding is controlled mechanically, in order to grind each part of the tool in rotation.

Sintered carbide tools to be ground should be moved over the whole diamond grinding area of the grinding wheel with low surface pressure in order to achieve even wear of the diamond layer. The shank material should be well rough ground with electro-corundum grinding wheels, for the grinding of shank material with diamond grinding wheels leads to a glazing of the grinding area. In order to prolong considerably the tool life of the diamond grinding wheel, grinding with all diamond wheels should, as a general principle, be done with at least some supply of coolant.

In metal bonded diamond grinding wheels, which always remove larger quantities of sintered carbide, the use of a powerful cooling system is recommended to remove the grinding swarf from the grinding area, conduct away the heat and thus avoid the occurrence of microflaws in the sintered carbide. For cooling a paraffin mixture can be used (2 parts paraffin and 1 part highly fluid oil). Dry grinding is possible with both bronze and resin-bonded wheels. Greater wear of the diamond wheels must then also be accepted, however, unless the wheels used have a high diamond concentration.

For dry grinding Winter-S diamond grinding wheels can also be used satisfactorily. The exposed diamond points of this wheel make it particularly suited for this.

In order to spare the valuable diamond grinding wheels, badly broken sintered carbide cutting edges, or freshly brazed sintered carbide tools should be well rough ground with silicon carbide grinding wheels, particle size 46-80, hardness K.

The most favourable peripheral speeds lie between 30 and 120 ft/second. But even with lower peripheral speeds good work can be done with small grinding wheels or grinding tools.

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* Senator Kleinschmidt was made an honorary member of the Senate of the Technical University, Brunswick, in 1932, for his assistance to students teaching and staff of the University.

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1961 Volume 18
MARCH

DIAMOND MINING AND INDUSTRY

Accra as newest diamond market

Anon. *Diamond News* 1960 Vol 24 (3) pp 21, 23 (Dec)

Estimates the effects of the Ghanian Government's decision to insist that all diamonds produced in Ghana must be sold through the Accra diamond market.

D *F.251.367*

Sierra Leone's alluvial diamond mining scheme

Anon. *Min J* 1961 Vol 256 (6544) pp 67, 69 (Jan 20)

Outlines the steps taken by the Sierra Leone Government to regularize diamond mining, particularly the Diamond Mining Scheme introduced in 1956, under which it became lawful for Africans to mine diamonds. An important result of the overall policy has been to reduce illicit diamond mining in 1959 to the lowest level for many years. *E* *F Hd.3672*

Diamond rush in British Guiana

Anon. *Diamond News* 1960 Vol 24 (3) p 13 (Dec)

It is reported from Georgetown, that rich diamond finds in the past fortnight have started a big rush to Ekereku in the interior. *D* *Eb.12.3474*

Life of Jagersfontein Mine to be prolonged [:] Production from new level in 1964

Anon. *Diamond News* 1960 Vol 24 (3) p 7 (Dec)

D *Eb.361*

Growth of the diamond cutting industry in Israel. Israels Diamantschleifereien im Aufstieg

Anon. *Gold u Silber* 1960 Vol 13 (12) p 50 (Dec) (In German)

The recently established Israeli diamond cutting industry is now processing ¼ of the number of industrial diamonds cut in Belgium. Israeli diamond cutters are optimistic and expect this figure to increase to 50% of the Belgian total in the foreseeable future.

K *F Hl.25.351*

Developments on the Yakutia diamond fields of Siberia

Anon. *S Afr Min Engng J* 1960 Vol 71 Pt 2 (3530) p 823 (Sep 30)

Describes general problems, production plans, and Mir geology. *D* *Eb.132.332*

North America's only diamond field

E. L. Howe. *Australian Gemmologist* 1960 Vol 3 (1) pp 16-17 ; *J Gemm* 1961 Vol 8 (1) p 39 (Jan)

A short article on the diamond field at Murfreesboro which was first found in 1906.

E *Eb.341*

The elusive Scottish gem minerals

N. W. Kennedy. *Gemmologist* 1961 Vol 30 (354) pp 3-8 (Jan)

The finding of diamonds in Scotland is mentioned and the possibility that they might occur there discussed.

E *Eb.12.321*

' City of diamonds '—Kimberley

Anon. *Optima* 1960 Vol 10 (4) pp 212-213 (Dec)

A general article which mentions the history of the proposed plans for Kimberley, and for the connection of Kimberley with De Beers, 2 illustr.

E *Eb.61/Eb.612*

Soviet diamond agreement renewed

Anon. *Financial Times* 1961 (22294) p 9 (Jan 19)

The exclusive agreement between the Diamond Corporation and the Soviet authorities under which all Soviet diamonds intended for sale in the West are purchased by the Corporation and marketed through the Central Selling Organisation of the De Beers' Group has been renewed for a further year.

D *F.131.33*

Russia may have huge diamond reserves by 1965

Anon. *Diamond News* 1960 Vol 24 (3) p 29 (Dec)

Discusses implications of a *Birmingham Mail* report that, according to the latest revision of the Seven-Year Plan, the Peace diamond mine and its subsidiaries in Russia will be at full capacity by 1965, and the Lucky Strike mine by 1970. 1 illustr.

D *F.25.33*

Enormous diamond area discovered in the Soviet Union. Riesiges Diamantenfeld in der Sowjetunion entdeckt

Anon. *Draht* 1961 Vol 12 (1) p 44 (Jan) (In German)

Refers to the *Tass* report of the discovery of a very large, very rich diamond area in Yakutia.

A *Ebb.12.332*

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Jerusalem's diamond centre

J. Raphael. *Gemmologist* 1961 Vol 30 (354) pp 17-18 (Jan)

A general article giving the economic background to the building of this diamond centre.

E *F.25.351*

Conditions governing the formation of diamond deposits

V. S. Sobolev. *Geol i geofiz* 1960 (1) pp 7-22; *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (9) p 2852 (Dec) (Original in Russian, summary in English)

E *Eb Hb*

PHYSICAL, CHEMICAL, & MECHANICAL PROPERTIES OF DIAMOND

Some comments on the infrared spectra of diamond, silicon, and germanium

G. B. B. M. Sutherland (National Physical Lab). *J opt Soc Amer* 1960 Vol 50 (12) pp 1201-1203 (Dec)

The infrared spectra of diamond, silicon, and germanium still present problems of interpretation. The discovery of nitrogen as an impurity in certain diamonds which activates the fundamental lattice frequencies raises the question of whether analogous impurities may have been overlooked in silicon and germanium. The way in which the nitrogen is incorporated into the diamond lattice is far from clear and there would appear to be additional impurity centres in diamonds, classified as type I by infrared analysis, in order to account for the remarkable variations in the infrared spectra of such diamonds.

D *Bfc Ukj/Bfr Ukj/F Ukj*

The SiK β bands of radio emission spectra of silicon, silicon carbide, and silica. Die SiK β—Banden der Röntgenemissionsspektren von elemenrarem Silicium, Siliciumcarbid and Siliciumdioxyd

B. Kern. *Z Phys* 1960 Vol 159 (2) pp 178-193 (June) (In German)

The SiKβ emission bands of silicon, silicon carbide, and silica, hitherto unknown or known inaccurately, were photographed using a high dispersion focusing spectrograph. The results are presented in form of photometer curves and in a table giving the energy values for structural features. For silicon, silicon carbide, and silica all emission bands of the elements concerned are now known. A comparison of the emissions, together with that of diamond, indicates that the spectra essentially represent the form of the energy bands of the valency electrons and that they are little influenced by unusual excited states. The emission bands of silicon, silicon carbide, and diamond to a great extent show similar features, thereby indicating an essentially covalent type of bonding in all cases, including silicon carbide. The emission forms are in rough agreement with the calculated valency band structures. 7 illustr, 25 ref, 2 tables.

A *Bhc Ukjb/Fu Kjb/Rgc Ukjb/Rl Ukjb*

Temperature dependence of the electrical conductivity of diamonds

K. N. Pogodaev. *Fiz tver tela* 1960 Vol 2 (7) pp 1450-1456 (July); *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (8) p 2554 (Nov) (Original in Russian)

D *F Uec Vb*

The ' ballas ' form of diamond

R. B. Fischer (Battelle Memorial Inst). *Nature, Lond* 1961 Vol 189 (4758) p 50 (Jan 7)

The writer recently examined the polished section of a ballas with a view to determining its structure. The section was made about 0.5 mm from the centre of a 0.7 ct stone and, after polishing, was etched in molten potassium nitride for 1 h at 700° centigrade. A photomicrograph shows the polished and etched surface at 30 ×; residual scratches from the sectioning step are still visible. The many crystals making up the ballas do not appear to have any radial geometry, which indicates that previous descriptions of ballas diamonds are imprecise, or that this particular ballas is an unusual variation. 4 refs, 1 illustr.

D *Fe Vw*

The luminescence spectra of diamond

A. Jayaraman. *Indian Acad Sci Proc A* 1960 Vol 52 (5) pp 189-196 (Nov)

Results of study of the luminescence spectra of diamonds recorded at liquid-air temperature of 80° K. The existence of three new electronic emissions centred at λ4958, λ5106, and λ5786 was revealed which come out with great intensity along the vibrational bands excited by them. Numerous sharp electronic lines also appear in the spectrum of some of the diamonds. Materials and methods, experimental results, and the lattice spectrum of diamond are dealt with. 5 illustr, 3 tables, 6 ref.

E *F Ukn*

Developments and highlights at the Gem Trade Lab in New York [:] Grayish-yellow diamond

G. R. Crowningshield. *Gems & Gemology* 1960 Vol 10 (3) p 71 (Fall)

A 17 ct marquise diamond of a nondescript greyish-yellowish colour was found to be highly conductive, although most electro-conductive diamonds reported have been blue.

D *F Gb Uec*

Developments and highlights at the Gem Trade Lab in New York [:] Pink diamond

G. R. Crowningshield. *Gems & Gemology* 1960 Vol 10 (3) p 74 (Fall)

Reactions of a highly laminated pink diamond to long-wave ultra-violet light and X-rays are recorded.

See also *Industr Diam Abstr* 1960 Vol 17 p A163 (July).

D *F Gbk Ukl*

X-ray orientation lengthens the life of diamonds. L'orientation par les rayons X augmente la durée des diamants

G. Cany. *Machine-Outil Française* 1960 Vol 25 (159) p 223 (Nov) (In French)

Diamonds are harder when set in one direction than another. A new technique using X-rays enables the hardest plane to be found. A beam of X-rays is directed into the diamond. Three fluorescent spots at the corners of the screen show that the beam is in line with one of the axes of the diamond. When truing a grinding wheel the diamond is applied perpendicularly and is used until approximately 15% of the stone is left. 3 illustr.

A *F Ubc Vhc*

The other properties of diamond

Anon. *Diamond Data* 1960 Vol 1 (4) pp 1-3 (May)

With the increasing availability of diamond grit, the properties of diamond other than hardness are of added interest because they suggest uses that take fuller advantage of the unique combination of capabilities of diamond grit. These properties are discussed with reference to applications of diamond in industry. 1 table, 8 ref.

D *Fc U/Kl U*

Inclusions in diamond

W. F. Eppler. *J Gemm* 1961 Vol 8 (1) pp 1-13 (Jan)

Not every inclusion in diamond is a carbon spot even though particles which look black are so called. Listed is a number of solid inclusions found in diamond of which apatite is the most recent. A number of examples are discussed. Only industrial diamonds were examined but no evidence could be found that graphite and quartz are present. 24 illustr, 5 ref.

E *F Gk*

Thermal expansion of diamonds from 25° to 750° K

S. I. Novikova. *Fiz tver tela* 1960 Vol 2 (7) pp 1617-1618 (July); *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (8) p 2554 (Nov) (Original in Russian)

D *F Udc*

Did you know . . . [Breath test on diamonds]. Wussten Sie schon . . .

F. Bauss. *Dtsch Goldschmiede Ztg* 1960 Vol 58 (12) pp 744-745 (Dec) (In German)

It is explained that a breath test can be made on diamonds. It is difficult to produce a mist on diamond, and the moisture quickly vanishes. Other stones that resemble diamonds, however, such as white sapphires, white topaz, zircon and also glass, hold the moisture longer.

A *F Hkb.1456*

Man-made diamonds get bigger

General Electric Research Lab. *Prod Engng* 1961 Vol 32 (3) p 17 (Jan 16)

A photograph shows examples of one carat diamonds produced by the GEC process but unsuitable for industrial use since they lack sufficient mechanical strength. 1 illustr.

D *Fh Qc.132*

The synthetic diamond (I). Der synthetische Diamant (I)

E. Guebelin. *Gold u Silber* 1960 Vol 13 (12) pp 36-38 (Dec) (In German)

This article attempts to survey the existing knowledge of the diamond synthesis, taking as a basic example the GEC process. (To be cont). 3 illustr, 8 ref.

K *Fh Ha*

The synthetic diamond (II). Der synthetische Diamant II

E. Guebelin. *Gold u Silber* 1961 Vol 14 (1) pp 20-22 (Jan) (In German)

In this article the construction of the pressure chamber and the formation of the diamonds are discussed. 7 illustr.

A *Fh Ha*

Annual meeting of the German Society of Gemmology. Jahresversammlung der Deutschen Gesellschaft für Edelsteinkunde

Anon. *Dtsch Goldschmiede Ztg* 1960 Vol 58 (12) p 738 (Dec) (In German)

The meeting was opened with Prof K. Schlossmacher's lecture on synthetic diamonds in which he described the development of the last years and explained techniques by means of slides.

A *Fh.54*

PHYSICAL, CHEMICAL, & MECHANICAL PROPERTIES OF HARD MATERIALS

Gem testing by non-destructive testing methods

B. W. Anderson. *Non-Destructive Testing* 1960 Vol 2 (2) pp 3-8 (Aug); *J Gemm* 1961 Vol 8 (1) p 39 (Jan)

E *Bb Cy.1456*

The refractive index of crystalline and fused quartz in the spectral region of 100 μ. Der Brechungsindex von kristallinem und geschmolzenem Quarz im Spektralbereich um 100 μ

R. Geick. *Zeits für Phys* 1961 Vol 161 (1) pp 116-122 (Dec 1) (In German)

6 illustr, 8 ref.

A *Bcb Uknb*

How to identify minerals—Part 2—Physical characteristics of minerals

V. M. Arciniega. *Mineralogist* 1961 Vol 29 (1/2) pp 8-12, 14 (Jan-Feb)

Lists the minerals needed for hardness testing on the Mohs' scale, diamond being 10, and the techniques used. 3 illustr.

E *Bc Um*

Advances in X-ray analysis : Vol 2, Proceedings of the Seventh Annual Conference on Industrial Applications of X-Ray Analysis, 1958

W. M. Mueller. *Ceram Abstr* 1961 Vol 44 (1) p 25 (Jan) Book, Univ of Denver, Denver 10, Colo. 1959, 359 pp, illustr. Price $7.50.

Among the 25 papers are some dealing with various aspects of crystal perfection and orientation; others cover X-ray diffraction techniques and X-ray microscopy.

[Not in library of Industrial Diamond Information Bureau].

D *Uklb.52/Vjf.52*

Macolaepp wheels, hand laps and stones

Monks & Crane Ltd, Garretts Green Lane, Birmingham 33. *Machinery, Lond* 1961 Vol 98 (2514) p 160 (Jan 18)

The special synthetic abrasive used is said to have a hardness of 9.5 to 9.8 on the Moh's scale. Examples are given of products available. Wheels can be dressed with another Macolaepp wheel or hand lap. 1 illustr.

D *Chd Rdf*

Newcomer Products announces 5 grades of cemented [sintered] carbides

Newcomer Products Inc, Latrobe, Pa. *Amer Mach* 1960 Vol 104 (25) p 149 (Dec 12)

Five newly developed grades of sintered carbides, called NewBide, have Rockwell (A) hardness ranging from 91.2 to 93.0, and transverse rupture strengths from 225,000 to 325,000/sq. inch.

D *Rh Unhcd*

Refractory novelties

Union Carbide Ltd, Alloys Div, London W 1. *New Scientist* 1960 Vol 8 (209) p 1322

Three grades of ceramics, two composed of silicon nitride and the third containing this material, are to be marketed under the trade name Unimic. Tests are said to have shown that the refractories stand up to temperatures above 1,000° C without undergoing dimensional changes. Components can be made to extremely close tolerances, *ie* 0.0005 in. in the case of two of the grades, without expensive machining methods being necessary.

D *Snb U*

Special ceramics for high-temperature work

Anon. *New Scientist* 1961 Vol 9 (219) p 212 (Jan 26)

E *Pdd:Ceq Vbc*

Ceramic material

Anon. *Financial Times* 1961 (22,307) p 13 (Feb 3)

A slightly resilient ceramic material produced in the USA may find some use in high temperature gaskets; it can be machined with standard cutting tools.

E *Snb.132.342*

Silicon in steel

Anon. *Mech World* 1961 Vol 141 (3499) pp 53-54 (Feb)

Carbon, silicon and sulphur contents can be used to indicate in a general way the machinability of steels, and uniformity in this respect can be achieved by strict control of these three elements.

D *Bfd Unp*

Abrasion resistance of tool materials

Anon. *Machinery, NY* 1961 Vol 67 (5) p 124 (Jan)

It is often found that there are considerable differences in the abrasion resistance of various tool materials which have the same hardness. This is discussed in relation to tool wear. *E* *Ba Ungc*

Influence of cold working carbon steels on their machinability

E. Bodart, L. Czaplicki. *Microtecnic* 1960 Vol 14 (6) pp 255-257 (Dec) (In English)

3 illustr. *E* *Bfdz Ceqz Unp*

Elimination of internal tensions in steel for tools containing 1.20% carbon. Elimination des tensions internes dans un acier à outils à 1,20% de carbone

A. A. Gol'denberg. *Metallovedenie i Obrabotka Metallov (USSR)* 1958 pp 6-11 (Feb); *Métallurg & constr mécan* 1960 Vol 92 (8) p 597 (Aug) (In French, original in Russian)

A *Pd Rw U*

DIAMOND, ETC, IN INSTRUMENTS

Diamonds and sapphires broaden IR use

Anon. *Chem & Engng News* 1960 Vol 38 (39) p 120

138th ACS National Meeting, Physical Chemistry.

A cell has recently been developed using diamonds and sapphires as window materials. It can be used to study the infrared spectra of a wide variety of solids in the 2 to 35 μ range. The use of the cell makes it possible to record spectra which cannot be obtained by other methods, the cubic boron nitride spectrum being an example. This spectrum can easily be obtained on a small crystal crushed by the diamond anvils. Reactive and relatively unstable materials can be studied, as the diamonds are inert. The infrared cell proper is made up of two gem-cut type II diamonds with markedly different surface areas to eliminate axial alignment problems. The structure and application of the cell are described. 1 illustr.

L *Bz Ukjcb Vw:F*

Analysis in the use of optical flats

S. W. Hugo. *Mech World* 1961 Vol 141 (3498) pp 6-10 (Jan)

A discussion of the geometrical analysis of the possible errors arising in the lapping of gauge surfaces and their comparison with a reference standard by methods of comparative interferometry. The methods are equally applicable to the checking of slip gauges and notes on the checking of secondary gauges are appended. 12 illustr. *X* *Az Chd.21*

Diamond needles for profilometers and profilographs

G. S. Vil'ner. *Standartizatsiia* 1960 Vol 24 (8) pp 42-43 (Aug); *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (9) p 2852 (Dec) (Original in Russian)

E *Nfs Wgfb*

The Johns Hopkins University and diffraction gratings

J. Strong. *J opt Soc Amer* 1960 Vol 50 (12) pp 1148-1152 (Dec)

Contributions to the history of the diffraction grating are set out in the form of quotations from Johns Hopkins records and other sources. A method for grinding successfully the diamond points for ruling the gratings was reported in 1932-3. Special diamond holders added to the ruling engines enabled the diamond points to be changed from one engine to another and retain their adjustment.

D *Az Cpf/F Hn/Tfd.28*

The ultra-thin section method in electron microscopy

G. Bartsch. *Jena Rev* 1960 Vol 5 (6) pp 213-215 (In English)

The report surveys the present state in bacterial cytology and some of the problems involved. The ultra-thin specimens described were produced by means of glass knives on ultramicrotomes according to Sjoestrand or Porter and Blum. 10 illustr, 20 ref.

D *Pdmz*

A simplified method for measuring the tangential component of a cutting force

S. N. Filonenko, Yu. N. Gonchar. *Machines & Tooling* 1960 Vol 31 (9) pp 39-40 (Original in Russian)

Gives a description of a mechanical dynamometer for measuring the tangential component of the cutting force during fine boring. It is said to be simple to make and use, and to give satisfactory accuracy. 3 illustr. *D* *Cfdb Uqg Vfd Wgd*

Transistorized instrument measures thickness ultrasonically

Magnaflux Corp, Chicago. *Non-destr Test* 1960 Vol 18 (6) pp 368, 370 (Nov-Dec)

A completely transistorized battery-operated ultrasonic instrument, the Sonizon SO-300, measures wall thickness between 0.025 and 2.5 in., and gives instantaneous reading by placing a transducer on the surface to be measured and turning a dial.

D *Az Cz Vwghb Web*

Inspection problems solved by . . . weaving trace optical gauging technique

J. E. Baty & Co Ltd. *Metalworking Prod* 1960 Vol 104 (52) pp 43-46 (Dec 28)

Describes the working of the Optotrace, which employs a diamond scriber, in some detail.

See also *Industr Diam Abstr* 1960 Vol 17 p A212 (Sep). 7 illustr. *E* *Ncz Wc*

Roughometer and autodrive

Marduth Products, Hinckley, Ohio. *Non-destr Test* 1960 Vol 18 (6) p 371 (Nov-Dec)

The Roughometer SR-14 is a portable instrument for the measurement of surface roughness of metal and plastic parts. A small pick-up can be hand-operated or used with a mechanical tracer.

D *Wgf*

Electron microscopy and microradiography. Microcopie électronique et microradiographie

A. Dessart. *L'Usine Belge* 1960 Vol 37 (1701) pp 11-12 (Sep 24) (In French)

Included in an article on industrial metrology, this section outlines the general principles of modern microscopy and microradiography, and reviews the Philips electron microscope EM 100B. 1 ref.

A *Vjg*

Automatic setting and registration in connection with x-ray diffractometers

W. A. Wooster. *Sov Phys—Crystallogr* 1960 Vol 5 (3) pp 355-361 (Nov-Dec) (Original in Russian)

X-ray goniometers fall into two groups, here referred to as 'normal-beam' and 'equiinclination'. The distinguishing features of the two groups are explained, and two instruments of each type are described in detail. 7 illustr. *D Wcez*

HARDNESS AND WEAR TESTING

Revised standards for roughness specimen

Anon. *Metalworking Prod* 1961 Vol 105 (5) p 12 (Feb 1)

The British Standard for roughness comparison specimens (BS 2634 : Part 1) has been revised to cover both flat ground and cylindrically ground types of specimen and to ensure that the specimens correspond more closely to those produced in America and Canada. *D Unf.255.321*

How de Havilland hard anodize missile parts

W. J. Campbell. *Metalworking Prod* 1961 Vol 105 (5) pp 59-62 (Feb 1)

Hardness measurement of coatings is among production problems involved. The Brinell ball cannot be used; nor can a heavily loaded diamond pyramid. Micro-hardness tests with the Vickers diamond pyramid will give figures of about 450 VPN on a coating which would appear to have a file hardness of 900 VPN : a graph gives some explanation of this, showing that Vickers hardness values may appear low at first, compared with HSS, but rise with repeated scratches. *D Az Cvdb Nd*

Evaluation of hot hardness measuring techniques and the development of a hot microhardness tester

L. P. Whitney, G. W. Webb, R. A. Gulick. PB Rep 126492, 122 pp; *US Govt Research Reps* 1958 Vol 29 (3) p 134; *Ceram Abstr* 1961 Vol 44 (1) p 18 (Jan)

A study was made of all known hardness measuring methods and the techniques used for microhardness and hot hardness testing. Although no suitable apparatus was found, it was concluded that a microhardness tester could be built to operate at 1,250° F which would permit an indentation to be located with nearly the same degree of accuracy as at room temperature. A special model Tukon tester was equipped with a suitable temperature-controlled furnace, mechanical stage, atmosphere purifying equipment, measuring microscope, and other adjuncts. A Knoop diamond indenter and a hydrogen atmosphere were employed. *X Cv.1456.21/Wghd.132*

Using the Brinell test system in investigating the abrasive wear of metals

M. A. Babichev. *Tren i izn mash* 1960 (14) pp 5-36; *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (8) p 2492 (Nov) (Original in Russian)

D Bf Cvd Unkcd

Bruel & Kjaer type 6102 surface roughness meter

George Cohen, Sons & Co Ltd, Bulver Street, London W 12. *Machinery, Lond* 1961 Vol 98 (2514) p 136 (Jan 18)

Type 6102 roughness meter is an improved version of type 6100. Alterations affect only the electronic system of the instrument. 1 illustr. *D Wgf*

TRUING OF GRINDING WHEELS

New methods of grinding wheel truing

C. L. Whitaker. *Metalworking Prod* 1961 Vol 105 (4) pp 61-65 (Jan 25)

Describes techniques designed to supplement single-point diamond dressing when this does not meet all the necessary requirements for accurate truing of wheel form, due to problems arising from diamond wear and heat dissipation. Among developments outlined is controlled incremental indexing of a single-point diamond before each pass of the tool across the grinding wheel surface; multiple diamond dressers and rotating diamond dressers both the tangential kind and the type designed so that the rotating diamond wheel axis is parallel to the grinding wheel axis. The benefits derived from use of each of these developments are described but it is stressed that they supplement single-point diamond dressing rather than supplant it. 6 illustr. *D Ab Cg Nj.1456*

Form dressing of diamond wheels

A. Rakestraw. *Grinding and Finishing* 1960 Vol 6 (12) p 13 (Dec)

Some simple forms can be touched up with a round fine grit silicon carbide stick by rolling the latter against the high sections. Some diamond wheel users correct worn forms with a brake-controlled diamond wheel dresser, the required face form being either diamond or crush trued on the silicon carbide wheel and then applied to the diamond wheel face. Many plants are said to have discarded the formed diamond wheel and replaced the method with optical grinders using a 1/32 in. thick wheel. The required tool form is outlined on a transparent screen, magnified many times. An optical lens enables the operator to position the thin diamond wheel so that the form can be reproduced on the tool. *D Nv:Cgh*

Are you losing on diamond dressing ?

C. H. Hill sen. *Grinding & Finishing* 1960 Vol 6 (12) pp 19-20 (Dec)

Misuse of the diamond in the dressing and truing of grinding wheels is a major cause of waste in production and money. Among areas of misuse are lack of coolant, turning coolant on a hot diamond, not turning the diamond, improper drag angle, and use of poor quality diamonds. Remedies are discussed. 2 illustr. *D Cg Nj.2592*

Grinding-wheel dresser

Machine Products Corp, Dayton, Ohio. *Machinery, NY* 1961 Vol 67 (5) pp 194, 196 (Jan)

The No 22 heavy-duty grinding wheel dresser has 2⅛ in. diameter cutters and a 2 in. cutting face; it is suitable, it is claimed, for all medium and large wheels. 1 illustr. *E Ab Cg Psf*

J & L E2 automatic form grinder

Anon. *Metalworking Prod* 1961 Vol 105 (3) pp 75-76 (Jan 18)

Although designed specifically for precision plunge grinding on shaft work, the J & L model E2 automatic form grinder is adaptable for other between-centres work, for chucking and for work requiring external shoe-type support. For automatic size control, the wheel slide is held against a positive stop by uniform hydraulic pressure. An automatic wheel truing device with controlled dressing can be applied once per piece or under automatic counter control for a predetermined number of pieces. 1 illustr.

D Chcb Prs Psf/Chcd Prs Psf

Power-driven dressing tool

Sidley Diamond Tool Co, 26045 W 7 Mile Rd, Detroit 40, Mich. *Carbide Engng* 1960 Vol 12 (12) p 31 (Dec); *Grinding & Finishing* 1960 Vol 6 (12) p 63 (Dec)

The Sidley Diamond Crushcutter traverse dressing tool consists of an alloy wheel into which several diamonds are set in rows across the peripheral surface. It is power-driven and electronically controlled with stepless speed variations, and is also available as a free running unit, actuated by the grinding wheel itself. The tool is designed to dress all kinds of grinding wheels on any kind of operation. It has been reported that the combined rotary and traversing action of the dressing tool enables the user to dress wheels faster and more accurately with less friction. 1 illustr.

D *Njd*

Machine tool rebuilding

J. Brockhouse & Co Ltd, Wolverhampton. *Mach Shop Mag* 1961 Vol 22 (1) pp 11-16 (Jan)

On the Brockhouse slideway grinding unit, accurate wheel truing is obtained by mounting a special attachment on the spindle head with a diamond set exactly on the spindle centre line and with the spindle itself accurately positioned vertically. 7 illustr.

E *Chc Pr Psf:Nj*

Production cylindrical grinder. Productions-Rundschleifmaschine

Anon. *Industr Anzeig* 1961 Vol 83 (2) pp 33-34 (Jan 6) (In German)

The machine is described in detail; its many special accessories include a hydraulic truing device which can transfer cylindrical, conical, reduced and curved profiles from the profile arm on to the grinding wheel. Truing proceeds automatically and the application of the truing diamond is scaled to 0.01 millimetre. The machine will take workpieces up to 250 mm or 300 mm in diameter with a grinding length of 500 mm and a span of 550 mm or workpieces with a grinding length of 750 mm and a span of 800 millimetres. 2 illustr.

A *Chcl Pr Psfb*

Thread grinding machine with testing device. Schneckenschleifmaschine und Prüfgerät

Anon. *Industrieblatt* 1960 Vol 60 (12) pp 819-820 (Dec 22) (In German)

A detailed description of the machine and its capabilities is given. The truing device is mounted above the grinding spindle, and the truing diamonds, two for the sides and one for the od of the wheel, are operated hydraulically. The truing device uses one-sided templates, the shape of which is transferred with high precision on to both sides of the grinding wheel by means of the side truing diamonds, which are controlled through connecting rods and levers. A third diamond trues the od of the grinding wheel. The machine has a large work capacity. 6 illustr.

A *Chcp Pr:Nj Psfb*

Adaptations do awkward jobs

Sir W. G. Armstrong Whitworth Aircraft Ltd. *Metalworking Prod* 1961 Vol 105 (3) pp 61-64 (Jan 18)

Reports adaptation of standard machine tools to solve problems arising in aircraft and missile production. One adaptation was carried out in order to inspect surface finish of components after machining. The component, a computator composed of copper segments with Melamine insulations between, is diamond trued on a Smart & Brown lathe at 280 rev/min with a 0.00015 in./rev feed. Surface finish must be to 3 micro-in, and the lathe has been modified to do this while the computator is still set-up. 8 illustr.

D *Ceqb Pr:Az Cg Nj*

It's a miniature world

Anon. *Diamond Data* 1960 Vol 1 (1) p 3 (Feb)

The ability of diamond to hold very close tolerances and achieve mirror finishes has made it the ideal tool material in obtaining the precision needed in tiny electronic components. Diamond wheels, points, and lapping powder have been used to produce bearings, the roundness of which is specified to millionths of an inch. The bearings are ground in a centreless grinder and are held in position by a carbide shoe. The precision with which the shoes are ground determines the roundness accuracy of the bearings: therefore the carbide is ground and lapped with diamond. The wheels of the grinding machine are trued with a diamond tool. In addition, the gauges used to measure accuracy of the bearings are diamond lapped.

D *Ax Chcc Nv/Axz Bk Chcw Nv Pr:Nj*

Grinding internal threads in bores 1″ i.d. and smaller

A. Rakestraw. *Grinding and Finishing* 1960 Vol 6 (12) p 13 (Dec)

Problems may arise in the diamond truing of the very small wheels because of interference of the grinding wheel quill and the mounting flanges. The short life of wheels mounted in this way may also be a problem. A method is described of overcoming these difficulties so that the permissible overhang of the wheel allows easy diamond truing of the wheel face and clearance for grinding the thread to the required depth in the bore.

D *Abmb Cg Nj*

Habit radii and periphery wheel dresser

Habit Diamond Tooling Ltd, Lurgan Ave, London W 6. *Mach Shop Mag* 1961 Vol 22 (2) p 114 (Feb)

The Tally-form radii and periphery dressing fixture has been developed to overcome the problem of dressing a grinding wheel to form a fillet radius which blends into the wheel periphery. One continuous movement is provided during which the diamond will dress to a pre-set radius and then move across the periphery of the wheel to a pre-determined point, the maximum combined travel of the slide being 1¼ inches. 1 illustr.

E *Ab Cg Nv Psfc*

Mortimer Machine Tool Demonstration

Mortimer Machine Tool Co Ltd; Mortimer Engng Co Ltd, Acton Lane, London NW 10. *Machinery, Lond* 1961 Vol 98 (2513) pp 97-99 (Jan 11)

Among machines handled by the company is the Jacobsens type SJ 12 hydraulic surface grinder which has a diamond wheel dressing attachment with micrometer adjustment mounted on the spindle head. Coolant from a reservoir is delivered by gravity through holes in the flange, and then passes radially through the grinding wheel under centrifugal action to be applied to the work directly at the point of cutting. 5 illustr.

D *Chcm Prx Psf:Nj Wbd*

Two-side grinding large components

Anon. *Metalworking Prod* 1961 Vol 105 (5) pp 65, 67 (Feb 1)

Boiler parts, up to 6 ft long and 3 ft wide are ground on both sides simultaneously on a specially designed twin-wheel disk grinder. The grinding wheels are dressed by a special diamond device which is fed between the grinding wheel in a similar manner to the workpieces and then reciprocated longitudinally by the powder-driven rollers. Once the grinding wheels have been set to the desired finished work thickness, the operator has only to load and unload components and make occasional compensation for wheel wear by adjustment of the spindle quills. 3 illustr.

D *Ab Cg Nj Psf*

First French Biennale : grinding machines. Première Biennale française de la machine-outil : Les machines à rectifier

Anon. *Machine-Outil Française* 1960 Vol 25 (157) pp 153-155, 157 (Aug-Sep) (In French)

Examples are given of the grinding machines exhibited. Of special interest is the truing system used on the Constructions Cluny machines. Truing is carried out by movement of the table and is fully automatic, according to the number of workpieces marked on the counter. This is claimed to enable the faithful copy grinding of profiles which could not be machined on other grinders. 7 illustr.

K *Chc Pr Psf*

Precisa bench-type surface grinder

British rep : H. G. Stevens Co Ltd, 16 Coverdale Rd, London NW 2. *Mach Shop Mag* 1961 Vol 22 (2) p 120 (Feb)

The Precisa FS 2 surface grinding machine precision grinds workpieces up to 7½ in. or with rectangular areas up to 6 in. by 12 in. and 4 in. by 16 inches. A dressing device is supplied which can be clamped to the side of the grinding head so that it is not necessary to alter the setting of the machine to carry out wheel dressing. 1 illustr.

E *Chcm Pr*

Gendron external grinder ROPA 25.50

Anon. *Métallurg constr mécan* 1960 Vol 92 (9) p 624 (Sep) (In French)

This machine is equipped with an automatic device for profiling the wheel.

A *Chcz Pr:Ab Cgf Psc*

BP 833,494 (May 23, 1956) **S. W. Hoare, Newall Engng Co Ltd**

Dressing of grinding wheels

The purpose of the truing device is the shaping of the face and the radiussed edges of a wheel so as to produce a continuous blend from the peripheral face into the radial face in one operation. The main slide of the unit moves along a main guide way parallel to the wheel axis. The diamond tool carrier moves

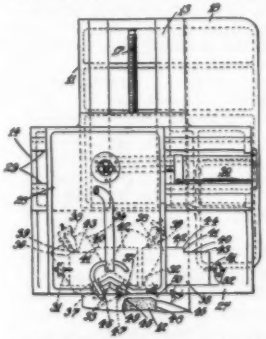


Fig. 1. BP 833,494.

transversely to the main slide and is controlled by a cam on the main slide and cam follower on the carrier, the member on the main slide being movable in an inclined path. It is preferable to employ two truing tool carriers and a third diamond may be useful in many cases for truing the peripheral face of the wheel. Fig 1 shows the arrangement of the truing unit 14. 38 is a broad feeler secured to tool stem 37. 31, 32 are the diamond tools arranged symmetrically on opposite sides of the central radial plane of the grinding wheel. 30 is a hydraulic unit for moving the upper part 28 of unit 14 which is fed by a ratchet and pawl mechanism turning screw 17. (8 claims, 3 illustr).

J *Ab Cg Njc Psf.545*

BP 833,538 **Cie des Machines Bull**

(May 28, 1956—conv date, France)

Supplying coolant to a dressing diamond or like tool in a grinding machine

The usual arrangement suffers from the fact that the liquid jet is not correctly directed towards the diamond even when positioned under the grinding wheel and

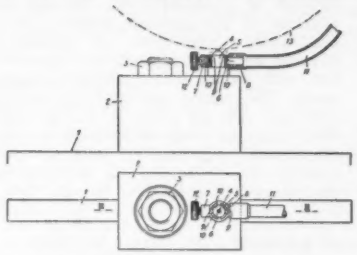


Fig 2 (below) and 3 (above). BP 833,538.

still less when above the wheel or laterally of it. The difficulties are overcome in a most simple way by surrounding the diamond by a ring from which coolant is sprinkled onto the diamond. Figs 2 and 3 show the arrangement on the table 1 of a surface grinder. Diamond 4 in support 5 is surrounded by hollow ring 6 connected to pipe 11. (6 claims, 2 illustr).

J *Nj Psf Qs.545*

BP 836,883 (June 12, 1956) **R. Allen, Engng Diamond Ltd**

Means for the trueing or dressing of grindstones and like circular cutting tools

The tool is supported in such a way that it can be moved along an arcuate path of any radius up to infinity and in either a convex or concave arc.

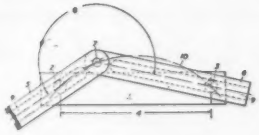


Fig 4 (top), 5 (centre), and 6 (below). BP 836,883.

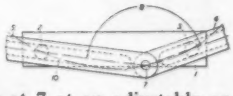


Fig 4, 5 and 6 show a base plate 1 carrying pegs 2, 3 at a fixed distance 4 apart. They are guided in slots 9 of bars 5, 6 hinged together at 7 at an adjustable angle. If the angle is greater than 180°, Fig 4, pivot 7 describes a convex arc 10 ; if the angle is 180°, Fig 5 arc 10 is of infinite radius and the pivot describes a straight line ; if the angle is less than 180° arc 10 is

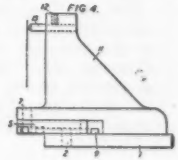
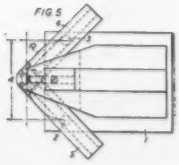


Fig 7 (above) and 8 (below). BP 836,883.



concave, Fig 6. The diamond tool 13 is in practice carried as in Fig 7 and the bars arranged as in Fig 8. (8 claims, 5 illustr).

J *Abz Cg Nj Psf.545*

USP 2,933,078 (May 22, 1958) **S. P. Bruce, A. T. Kohlstrunk, Wheel Trueing Tool Co**

Continuous diamond infeed and grinding wheel dresser

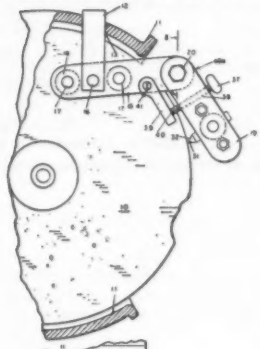
The device is intended for use in centerless grinders to keep the grinding wheel trued without stopping the flow of stock through the machine. The diamond is automatically incrementally advanced and the tool rotated a predetermined amount according to the attrition of the grinding wheel. The hydraulic feed is electrically controlled. A differential advance is effected by the independently operable clutch mechanism with wedge roller clutches around the feed screw shaft. The truing operation automatically stops whenever the flow of stock to the grinding wheels ceases. The diamond tool will have a longer life as the mechanism will true off only an infinitesimally small amount while keeping the grinding wheel in constant sharpness. (18 claims, 10 illustr). Ref cited : 1 USP.

J *Ab Cg Nj:Chcc Pr.545*

USP 2,934,057 (Oct 26, 1956) **A. Weining**

Grinding and dressing device

Fig 9 is a partial cross sectional view of the truing device attached to hood 11 over grinding wheel 10 by clamp 12. Bracket 15 rests on the side of the hood on pads 17 in rubber bushings 18 to minimize noise and vibrations. Arm 19 is pivotally attached to the bracket carrying diamond tool 32 and stop screw 38 abutting on adjustable stop 39.



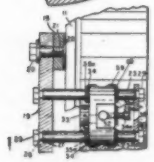


Fig 9 (above) and 10 (below). USP 2,934,057.

Fig 10 shows the tool holder 59 slidable with rubber bushings 34 aligned with metal lined bushings 35 on shafts 23. Diamond tool 32 is clamped in position by screw 34a accessible through hole 35 and nut 33. (2 claims, 5 illustr). Ref cited : 8 USP.

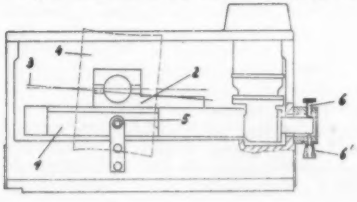
J *Njg Pj.545*

DAS 1,079,497 (Apr 19, 1958) **E. Rotzoll, Herminghausen-Werke GmbH**

Truing device for the control wheel of centreless circular grinders for through feed grinding. Abrichtvorrichtung für die Regelscheibe spitzenloser Rundschleifmaschinen beim Durchgangsschleifen

The usual truing of the control wheel at an angle corresponding to the angle of inclination of the wheel is theoretically correct only for a workpiece of the diameter O. The control wheel should be trued according to its size and angle of inclination and to the diameter of the workpiece. The correction of the angle which differs from the angle of inclination can be readily achieved by an arrangement as shown in Fig 11 in which the bed 1 with the truing tool slide is rockable about an axis 5 by means of micrometer screw 6 and 6'. (2 claims, 1 illustr). Ref cited : 1 BP.

J *Abcg Psf:Chcc Pr.545*



DAS 1,079,497. Fig 11.

DAS 1,080,432 (June 7, 1958) **H. O. Schmidt, Herminghausen-Werke GmbH**

Method for the truing of grinding wheels in accordance with vibrations caused by the tool becoming blunt. Verfahren zum Abrichten von Schleifscheiben in Abhängigkeit von Schwingungen beim Stumpfwerden des Werkzeugs

The usual method of keeping the wheel trued consists in counting the workpieces ground by a counting device and on reaching a predetermined number interrupt the work for a truing procedure. As a number of factors may influence the wear of the wheel which cannot be assessed with accuracy the wheel is always trued more often as necessary to be on the safe side and wheel and diamond wear is therefore excessive. This can be avoided by making the interruption of the working cycle dependent on the vibrations which start when the wheel becomes blunt. The work is controlled by a sensitive vibration measuring device with amplifier attached to the grinding machine and work is stopped when a certain amplitude is reached. It has been ascertained that every size or type of machine has a characteristic frequency and the measuring device can thus be set to this frequency eliminating stopping of the machine by short-time vibrations caused by other factors. (2 claims, no illustr).

J *Ab Cg Nj.545*

DAS 1,080,433 (Oct 30, 1956) **W. Osenberg**

Method and device for re-sharpening and/or profiling grinding bodies, in particular grinding wheels and belts. Verfahren und Vorrichtung zum Wiederanschärfen bzw. Profilieren von Schleifkörpern, insbesondere Schleifscheiben und Schleifbändern

Loose particles of hard materials are directed at surface speed of the bodies in a nozzle like aperture onto the grinding face so that the abrasive grains are subjected to great mechanical stress and are partly broken. Clogged parts of the grinding face are opened up. Fig 12 and 13 show arrangements for a grinding belt 50 and a grinding wheel 51. A counter pressure block 4 forms a nozzle with inclined entry and exit faces 5, 6 through which the particles of hard material are forced either by compressed air or by centrifugal force to pass out through exhauster channel 10. The particles are to be chosen according to the hardness of the abrasive grains. This refers also to the material of the counter block 4 which may be faced with a boron carbide layer. The block may be vibrated *eg* by ultrasonic means. (9 claims, 2 illustr). Ref cited : 1 GP ; 2 DBP ; 2 Swiss P ; 3 USP.

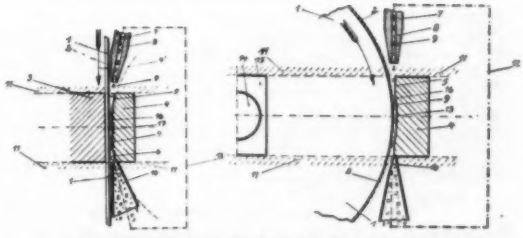


Fig 12 (left) and 13 (right). DAS 1,080,433.

J *Ab Cg Psf.545*

PRECISION MACHINING OF METALS

Tooth rounding of shifting gears

I. E. Burshtein. *Machines & Tooling* 1960 Vol 31 (9) pp 33-37 (Original in Russian)

Describes a new method for tooth rounding and removing chamfers along the contour of tooth ends, which is said to be applicable to some 80% of shifting gears. Among advantages claimed is the simplicity and strength of disk cutters which replace end cutters when machining by the method described, and the much lower cost of grinding. 16 illustr.

D *Adz Ceq.1456*

Countersinking drills with one cutting edge

V. Rochek. *Machines & Tooling* 1960 Vol 31 (9) pp 38-39 (Original in Russian)

Describes drills with single cutting edges which can replace the multi-tooth countersink drills usually used for removing burrs and chamfers in holes, and can also machine recesses under countersunk screw heads. The new drills are said to be much simpler and cheaper to produce. 3 illustr. *D* *Plj*

Automated accuracy—made possible by precision fixtures

W. R. Opel. *Tool & Mfg Engr* 1961 Vol 46 (1) pp 96-98 (Jan)

Describes how precision fixturing enabled accuracy requirements to be met in the design of a transfer machine for milling, boring, and reaming transmission cases. Hole size tolerances as small as ±0.00035 in. had to be met. 5 illustr.

D *Az Ceq Pr.132*

Turning hardened tool steels—with ceramic tools

F. L. Bagley jun. *Tool & Mfg Engr* 1961 Vol 46 (1) pp 99-101 (Jan)

It is stated that some of the breakdowns of ceramic tools in service are attributable to tool design, rather than to the ceramic material itself. Experiments at Watertown Arsenal are said to have shown that even hardened steels can be successfully cut with ceramics when large negative rake angles are used. 5 illustr.

D *Bfdgz Ceg Pdd.21*

Saving cost and time by using clamping tools in turning, drilling and planing. Kosten- und Zeitersparnis durch Klemmwerkzeuge beim Drehen, Bohren und Hobeln

R. Schwarz. *TZ f prakt Metallbearb* 1960 Vol 54 (12) p 619 (Dec) (In German)

Two systems are briefly discussed. In the first the holder is firmly clamped in the machine and the insert can be taken out and re-sharpened. The tool is made by Karl Hertel and is intended mainly for sintered carbide and high-speed steel. The throw-away system uses the Fix-Perfect sintered carbide clamping tool. The cutter is made entirely of sintered carbide, which has eight cutting edges. When one edge is blunt, the tool is turned; when all eight edges have become blunt the tool is thrown away, as re-sharpening is uneconomical. 2 illustr.

A *Pdcb Uq|Psp Uq*

Fully automatic machine tools for the production of gear wheels. Vollautomatische Werkzeugmaschinen für die Zahnradfertigung

K. W. Michler. *TZ f prakt Metallbearb* 1960 Vol 54 (12) pp 598-600 (Dec) (In German)

A number of gear cutting machines are described in general terms, and their automatic functioning discussed. 6 illustr. *A* *Ad Ceg Prs*

The origin of surface roughness in precision turning. Die Entstehung der Oberflächenrauheit beim Feindrehen

P. H. Brammertz. *Industr Anzeig* 1961 Vol 83 (2) pp 25-32 (Jan 6) (In German)

A comprehensive article on a new theory that has been put forward based on A. P. Sokolowski's investigations into minimum depth of cut. The theory is claimed to explain the origin of workpiece roughness and the formation of ridges on the face of the turning tool. 28 illustr, 17 ref. *A* *Ceqz Unf*

The total economics of tool use

H. Ernst. *Diamond Data* 1960 Vol 1 (1) pp 1-3 (Feb)

The author concludes that the selection of optimum cutting tool materials for repetitive machining operations, and efficient use of tools and machines, cannot be achieved by following any one set of rules. Minimum cost/piece and maximum production can be obtained only by analyzing the effects of all the variables of the metal cutting process on each of the cost components. However, a chart shown may be used to predict the best cutting speed for any given set of operating conditions. 3 illustr, 5 ref.

D *Ceg Pd.252*

Simplify your stainless steel machining

G. J. Stevens. *Canad Mach* 1960 Vol 71 (12) pp 101-103 (Dec)

Machine rigidity, chip control, and coolant are considered to be major factors in correct machining technique. Stainless steels are classified broadly into four groups for which appropriate advice is given. 10 illustr. *D* *Bfdb Ceq.1456*

Determining the fields of application of various machining methods

A. O. Etin. *Machines & Tooling* 1960 Vol 31 (8) pp 11-15 (Original in Russian)

This article deals briefly with the method developed at ENIMS for the comparative generalized analysis and determination of efficient fields of application of various metal cutting methods. 3 illustr.

D *Bf Ceg.21*

Conference 'Ceramic cutting tools' on the 5th and 6th of February 1960, in Leipzig. Fachtagung 'Schneidkeramik' am 5. und 6. Februar 1960 in Leipzig

R. Reinhold. *Fertigungstechnik u Betr*, Berl 1960 Vol 10 (11) pp 679-683, 695 (Nov) (In German)

An account of the conference is given, and various lectures are outlined. 17 illustr.

A *Bl Ceg.231*

International Committee reports new test code for machine tools

Anon. *Mach Lloyd* 1961 Vol 33 (2A) pp 23-24 (Jan 28)

Reports decisions of the International Committee on Machine Tools on a number of projects in the field of standardization of various machine tool features and components. The Machine Tool Test Code, devised by the committee and intended as a basic document relating to machines used for working metal by chip or swarf removal, standardizes methods of testing machine accuracy. *D* *Pr.1341.255*

A cross section of modern high duty lathes. Querschnitt moderner Hochleistungs-Drehmaschinen

K. W. Michler. *Die Maschine* 1960 Vol 14 (11) pp 29-34 (Nov) (In German)

A number of machines is reviewed and the conclusion is drawn that the machine tool industry has adapted itself well to the need for economic finishing and automation. 24 illustr. *A* *Ceqb Pr*

Coolants and cutting fluids for machining of metal. Kühl- und Schneidflüssigkeiten für die Metallbearbeitung

F. Kunowski. *TZ f prakt Metallbearb* 1960 Vol 54 (12) pp 583-594 (Dec) (In German)

A general article on the fluids used, their choice and usage. 17 illustr, 39 ref, 3 tables.

A *Sjk*

The use of sintered carbide tools in the turning of small parts on automatic centre and capstan lathes. Verwendung von Hartmetallwerkzeugen beim Drehen kleiner Teile auf Langdreh- und Revolverautomaten

E. Heusing. *Mschr Feinmech u Optik* 1960 Vol 77 (12) pp 355-360 (Dec) (In German)

A general article, including a discussion of the range, and preparation of sintered carbide tools. It is claimed at present 70% of all tools used in turning incorporate sintered carbide. 8 illustr.

A *Ceqb Pr Pdc.1451*

Machining titanium

Anon. *Mach Shop Mag* 1961 Vol 22 (2) pp 64-71 (Feb)

Includes broaching, milling, boring, drilling, grinding, and tapping. 16 illustr. *E* *Bfn Ceq*

Work hardening and surface texture when machining stainless steel

N. P. Golubov. *Machines & Tooling* 1960 Vol 31 (8) pp 34-35 ((Original in Russian)

1 illustr, 2 ref. *D* *Bfdb Ceq Unf*

Analytical cutting-tool design

Chance Vought Aircraft Inc. *Engrs' Dig* 1961 Vol 22 (1) pp 73-78 (Jan)

Reports results of investigations on the influence of cutting tool design on machining efficiency. 14 illustr.

D *Pd Uqe*

How to machine steels hardened to 50 Rc

Curtiss-Wright Corp, Wood-Ridge, NJ. *Amer Mach* 1960 Vol 104 (26) p 64 (Dec 26)

Summarizes a fourth report on the machining of superalloys recommending cutting conditions. 1 table.

D *Bfxz Ceq.1456*

Hayes Tracemaster 3-spindle copy milling machine for cylinder heads

Hayes (Engineers) Ltd, Gelderd Road, Leeds 12. *Machinery, Lond* 1961 Vol 98 (2516) p 270 (Feb 1)

2 illustr. *E* *Agz Cffz Pr*

Close-tolerance machining with Microbore tools

Enfield Cycle Co Ltd, Enfield Industrial Engines Ltd, Redditch. *Mach-Tool Rev* 1960 Vol 48 (288) pp 155-159 (Nov-Dec)

14 illustr. *D* *Cfdb Pd*

Taps and lathe tools in metallic carbides. Tarauds et outils de tour en carbures métalliques

Anon. *Métallurg constr mécan* 1960 Vol 92 (9) pp 675-680 (Sep) (In French)

From a general consideration of taps and lathe tools, the author proceeds to a more detailed discussion of principal types of taps, choice of tap, and special points concerning it, and cutting tools. 9 illustr, 2 tables.

A *Cfz P Rg/Pdc*

Measuring and increasing the accuracy of gear cutting machines

K. Shtepanek. *Machines & Tooling* 1960 Vol 31 (9) pp 18-24 (Original in Russian)

14 illustr. *D* *Ad Ceg Pr.132*

Special machine tools for chip producing processes

K. W. Michler. *Metall* 1960 Vol 14 (12) pp 1174-1181 (Dec) (In German)

An account is given of recent developments in the field, describing various lathes, borers, honing machines, and grinders and the operations which they perform. Of special interest is the section on tooth grinders, which gives as an example the HSP-8 tooth grinder for cutting gear wheels of 150 to 800 mm pitch diameter. 16 illustr. *K* *Ad Chc Pr*

CUTTING AND MACHINING OF STONE, GLASS, ETC.

How Harwell makes surface-barrier detectors

G. Dearnaley, A. B. Whitehead. *Nucleonics* 1961 Vol 19 (1) pp 72, 74-76 (Jan)

The method recommended for gold-silicon detectors is described and differences in technique for germanium explained. The crystals are cut to the size required by a diamond impregnated saw and lapped to a fine matte finish with aluminium oxide grit of about 7 μ before further operations. 3 illustr, 5 ref.

D *Az Bd Cej Nt*

Studies of reactions between uranium dioxide and graphite

B. Craven, E. R. McCartney. *J Amer ceram Soc* 1961 Vol 44 (1) pp 12-15 (Jan)

Experimental procedure included final grinding of the oxide pellet on a wax lap consisting of 400 mesh aluminium oxide dispersed in carnauba wax. Polishing was done on a napless cloth lap impregnated with diamond dust. All grinding and polishing was carried out under kerosene to stop air or moisture from reaching the reaction product layers. 5 illustr, 2 tables.

D *Az Bhz Chm Km Pge*

Transistor production in Japan

R. E. Green. *Machinery, Lond* 1961 Vol 98 (2516) pp 253-258 (Feb 1)

To obtain wafers of various thicknesses according to the requirements of the transistors, ingots are sliced on special machines using diamond impregnated wheels. Lapping machines are employed to reduce the thickness of wafers. 7 illustr.

E *Az Cej Nv Pr.373*

Smoothing car windows with diamond wheels

Ford Motor Co, Nashville, Tenn. *Optima* 1960 Vol 10 (4) pp 233-234 (Dec)

A system known as pencil edging, using contoured wheels impregnated with diamonds, has been developed for the Ford Motor Co. It is claimed that the operation is cleaner, faster, and more accurate than with abrasive belts and stone wheels previously used. Dressing is necessary only about half a dozen times during the wheel's working life of several million linear inches, and the number of handling operations has been reduced. *E* *Bm Chcs Nv.1456*

New gyro features precision ceramics

Anon. *Ceramic Age* 1960 Vol 76 (1) p 22; *Brit Ceram Abstr* 1960 (11) p 378A (Nov)

After firing, the ceramic gyro parts are machined and finish ground with diamond abrasive.

D *Az Bl Ceq Km/Az Bl Chct Km*

Jade cutting today

R. Norris Shreve. *Gems & Gemology* 1960 Vol 10 (3) pp 81-89 (Fall)

Compares the use of diamond saws for cutting jade with the traditional wire and disk cutting methods. 11 illustr.

E *Bcf Ceg Ng*Bcf Ceg Pcb*Bcf Ceg Pcc*

Ceramics for electronics still largely untilled field

P. V. Leffel. *Bull Amer Soc Test Mat* 1960 (250) p 16 (Dec)

Among pressing production problems needing research is the precision grinding of the finished pieces.

D *Az Bl Chcw.132*

Fall meeting of the Basic Science Division

J. E. Burke, S. P. Mitoff (GEC). *Bull Amer ceram Soc* 1960 Vol 39 (12) pp 750-751 (Dec)

A paper by P. Gibbs (Utah Univ) reported some results on the ionic transport in quartz crystals. A cylinder was ground from a crystal of quartz and a hole drilled in the centre of this cylinder. The rest of the experiment is outlined.

D *Bcb Cfb/Bcb Chc*

New slicing machine

DoAll Co, Des Plaines, Ill. *Tooling & Prod* 1961 Vol 26 (10) p 148 (Jan)

The MTM-612, designed for precision slicing of silicon, germanium, quartz, ceramics, ferrites, and carbides, has a thin diamond cutting wheel, driven without vibration by the precision spindle and flat belt drive. 1 illustr. *E* *Az Ba Cej Ngd Pr*

Producing nuclear engineering components from graphite

S. C. Poulsen. *Machinery, Lond* 1961 Vol 98 (2514) pp 128-131 (Jan 18)

Equipment of the machining section at Graviner Mfg Co includes a duplex milling machine for the facing and squaring of graphite blades, which the company made using the bed of an obsolete turret lathe. Curved segmental blades are milled to the required radii with a special attachment on a Huron universal machine. 6 illustr. *D* *Az Bhb Ceq Pr*

A new stone grinder. Ein neuer Steinschleifer

Bosch. *Aluminium* 1960 Vol 36 (11) p 683 (Nov) (In German)

Encased in aluminium, this grinder is very light and ready to use. It works at 2,000 rev/min, and can be used in the concrete and stone industry. 1 illustr.

A *Bn Chc Pr/Bny Chc Pr*

Diamond-coated band saws

Dia-Chrome Co. *Ceram Age* 1960 Vol 76 (4) pp 8-9 (Oct)

Saws with diamond cutting edges for cutting pattern shapes in glass-reinforced plastics, ceramics, pure glass, marble, etc, have been produced. These materials are extremely difficult and expensive to shape by conventional grinding or cutting methods.

E *Az Ba Ceg Ngz*

First ceramic gyros put U.S. ICBM's right on target

Anon. *Ceramic Industries* 1960 Vol 75 pp 58-61 (July); *Battelle Tech Rev—Abstr* 1960 Vol 19 (11) p 647a (Nov) (No 12000)

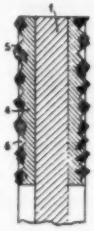
Production of the gyro was made possible by two important achievements, one being the development of an aluminium oxide ceramic material that can be diamond honed with the tiny and ultra precise shapes necessary. *D* *Az Bl Chh Nqe*

BP 833,309 **Philips Electrical Ind Ltd**

(Dec 24, 1957—conv date, Netherlands)

Abrasive cutting discs

Disks for cutting hard materials *eg* glass or ceramics, *etc*, tubes, rods, have diamond grains bonded to certain areas of their sides. Such disks however glaze rapidly, are not wear resistant and produce a high reject percentage because of wobble. It has been found that by providing additional recesses besides those for the diamonds in the sides of the disk not exceeding 15%



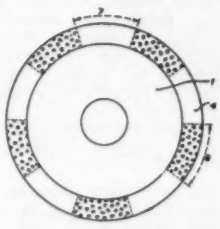


Fig 14 (left) and 15 (right). BP 833,309.

and irregularly distributed over the surfaces a great improvement could be obtained. The additional recesses should be produced in the finished disk to prevent warping. The recesses have a depth of about 0.2 mm in a disk of 200 mm diameter with a maximum thickness of 1 mm and the areas should be arranged in sectors staggered as *eg* in Fig 15 where sectors 8 are provided with recesses on one side, sectors 7 with recesses on the other side. Fig 14 is a partial magnified cross section showing the additional recesses 6 beside the recesses for the diamond grains 5. (6 claims, 4 illustr). *J* *Nvc.545*

USP 2,932,138 (Nov 10, 1958) **E. E. Flusksey, H. U. Brueckner, Revere Camera Co**

Method and apparatus for manufacturing precision lenses

In precision lens grinding, accuracy of the contour of the lapping surface is paramount as lenses are ground to Newtonian bands. Up to now highly skilled craftsmen carried out necessary corrections by trial and error methods. The laps shown in Fig 16, 17, 18 are adjustable to very fine limits to compensate for wear without

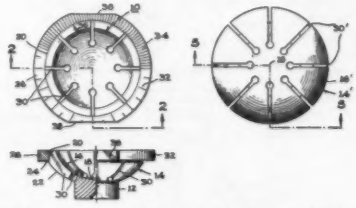


Fig 16 (top left), 17 (bottom left) and 18 (right). USP 2,932,138.

re-machining owing to the arrangements of radial slots and fine pitch tapered threads engaged by a compensating ring and a scale and index means for precise control. Fig 16 is a view of a concave lap, Fig 17 of a convex lap. Fig 18 is a schematic exaggerated view showing the progressive wear compensated by screwing down the compensating ring 32, Fig 16, according to scale 34. The graduation may be such in combination with certain dimensions of lap and tapered thread that by rotation corresponding to 3° of arc the diameter of the lap can be changed by a little more than half of a Newtonian band. (1 claim, 7 illustr). Ref cited: 3 USP; 1 FP. *J* *Bm Ceq Qe Tfb.545*

USP 2,932,925 (Feb 20, 1956) **E. T. Dalton, American Optical Co**

Apparatus and method of forming ophthalmic lenses

This apparatus is designed for producing a plurality of one piece multifocal lenses simultaneously with controlled characteristics and with a straight transverse line of division between the focal fields maintained at a practical minimum height. Distance and reading fields are divided by the straight transverse lines passing through the respective optical centres of distance and reading fields. Fig 22 is a fragmentary

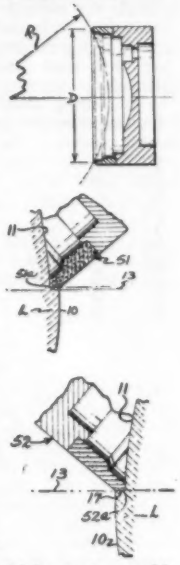
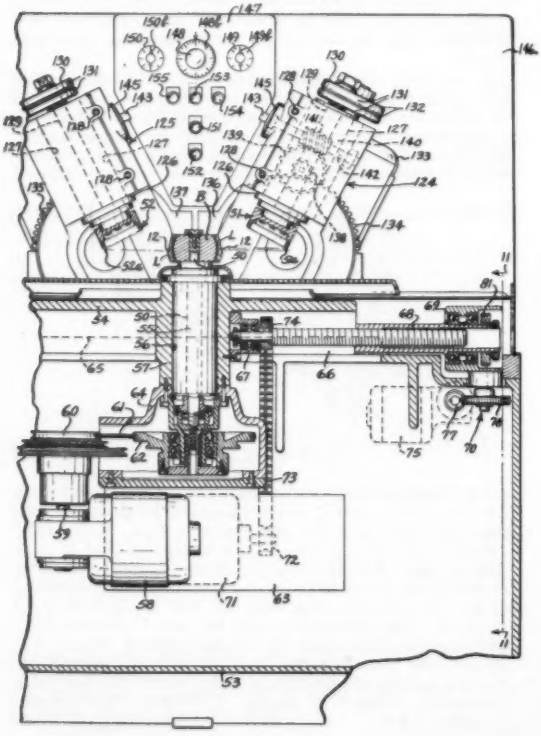


Fig 19 (top), 20 (centre), and 21 (bottom). USP 2,932,925.

sectional view showing the lens blanks L on block B selected in accordance with the particular surface curvature to be ultimately provided upon the reading field of the lens blanks so as to permit a relatively thin layer of pitch or other adhesive to be applied between blank and block. The blanks are preferably positioned in close edge-to-edge relationship with each other and any gap between last and first blanks should be filled with a glass filler of blank thickness to provide a continuous surface for the abrading and polishing tools. Fig 19, 20, 21 illustrate the cup-shaped rough and fine, preferably diamond charged, abrading tools 51 and 52 so mounted as to be pivotable about points 51a and 52a (see also Fig 22) at the lowest point on the cutting edge of the tools. The pivot point 52a of the fine abrading tool 52 is positioned so as to lie in a horizontal plane passing through the ultimate location of the optical centres, *ie* the dividing line 12. The cutting edge of the roughing tool is preferably about 3/64 in. above this line at its lowest point. A particular pair of tools is required for each desired change of curvature. The generating procedure is automatically carried out under push-button control. The fine abrading step is followed by a special polishing step in a separate device. (9 claims, 19 illustr). Ref cited: 3 USP. *J* *Qc Tfbz.545*

Fig 22 (below). USP 2,932,925.



Swiss P 343,254 (Nov 25, 1957) **W. Bangerter**

Method and device for grinding industrial jewels, in particular watch jewels. Verfahren und Vorrichtung zum Schleifen von Industriesteinen, insbesondere Uhrensteinen

(2 claims, 3 illustr).

D *Bb Chc Tc.545*

DAS 1,082,708 (July 5, 1957) **H. Schmidt, K. -H. Timmerkamp, Bünder Glas GmbH**

Device for pointing and scoring ampoules to be broken before use. Vorrichtung zum Punktieren und Ritzen von Brechampullen

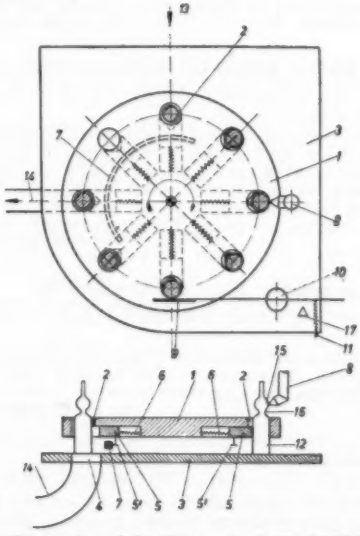


Fig 23 (top) and 24 (bottom). DAS 1,082,708.

It has been found advantageous to provide the ampoules with a score line but difficulties have been encountered with the correct clamping of the ampoules to be scored. As shown in Fig 23 and 24 ampoules 12 are arranged on a rotary table 1 in a clamping device consisting of a sliding prism 5 and a compression spring 6. 8 is a pointing device *ie* a kind of ball pen, and 9 is a diamond file to scratch the pointed ampoule. The diamond file 9 is easily movable a stop 17 limiting its movement. Instead of a file a diamond disk may be used. (5 claims, 2 illustr). Ref cited: 1 GP; 1 FP; 1 BP. *J* *Az Cpz Psc.545*

GEM POLISHING

Developments and highlights at the Gem Trade Lab in Los Angeles : Recutting a damaged diamond

L. B. Benson jun. *Gems & Gemology* 1960 Vol 10 (3) pp 80-92 (Fall)

Although a damaged diamond may lose 22% of weight during recutting, it is possible for its value to remain unchanged. An example is given to illustrate the importance of detailed proportion analysis in diamond evaluation.

D *F Hnz.252*

New diamond saws . . .

Anon. *Mineralogist* 1961 Vol 29 (1/2) pp 2-3 (Jan-Feb)

Discusses the development of a more effective saw for lapidary work than the standard circular diamond blade. Two recent developments are mentioned, a British band type diamond saw and an American diamond-charged rock saw, USP 2,912,968. While these new tools are improvements, it is considered that the most effective type of saw blade for lapidary work will prove to be a hacksaw type blade, charged with diamonds, similar to the power wood saw where a reciprocating blade replaces the familiar chain.

See also *Industr Diam Abstr* 1960 Vol 17 p A247 (Oct).

E *Bb Ceg Ng.132*

Identifying precious stones (XXIII). Wir bestimmen Edelsteine (XXIII)

Anon. *Gold u Silber* 1960 Vol 13 (12) pp 34-35 (Dec) (In German)

Continues the alphabetic list of precious stones begun in the previous article. The most common shape into which diamonds are cut is the brilliant form, and the most frequently found inclusions are : zircon, quartz, diopside, enstatite, graphite and certain ores, especially hametite and magnetite.

K *Bb Ccb.514/F Hk.514*

Identifying precious stones (XXIV). Wir bestimmen Edelsteine (XXIV)

Anon. *Gold u Silber* 1961 Vol 14 (1) pp 34-35 (Jan) (In German)

Continuation of the alphabetical list of precious material, listing characteristics.

A *Bb U.514*

ROCK DRILLING

Selection of economic hole size for slimhole drilling

W. W. Moore. *Petroleum Engr* 1960 Vol 32 (11) pp B-60, B-63, B-64 (Oct)

Slimhole drilling means the drilling of holes too small to receive 5½ in. casing. A guide in making a selection of economical hole sizes for drilling slimholes has been devised, based on the slenderness ratio of the well, this ratio being the depth of the hole in feet, divided by hole diameter in inches. The need for radically improved small diameter drilling bits is stressed. Diamond bits are useful for drilling small holes under good hydraulic conditions and in dense formations, but do not serve as universal type bits for all drilling conditions including sticky shales. 1 illustr.

L *Cfbs Njb/Cfbs Pl*

Mohole experiment postponed

Anon. *S Afr Min Engng J* 1960 Vol 71 Pt 2 (3543)

Refers to American experimental drilling of the deep sea-bed in connection with the Mohole project.

D *Bnt Cfb.1311.342*

Theory and practice of inclined drilling for surface mining

B. J. Kochanowsky. *Mineral Industries* 1960 Vol 30 (3) pp 1-5 (Dec)

The inclined drilling method, wherein boreholes are drilled at angles of 10 to 40° to the vertical, is said to have many advantages over vertical drilling. Methods and advantages are explained. 9 illustr.

D *Cfbz.1456*

Drilling in the Libyan desert

Loffland Bros. *World Oil* 1961 Vol 152 (1) pp 80-82 (Jan)

Conventional rotary diamond coring resembles practices used in similar drilling areas in the United States. Operations take place over an interval totalling up to 400 ft for each well ; a standard 6¼ in. od diamond core head obtains high recoveries in both carbonate and sandstone reservoirs. 3 illustr.

D *Az Cfb Nhb.368*

Cutting drilling time

Anon. *S Afr Min Engng J* 1960 Vol 71 Pt 2 (3542) p 1621 (Dec 23)

Refers to a system of handling rods and pipes which dispenses with the conventional block and tackle and uses a pair of hydraulic jacks to pull rods out of the borehole in a continuous 'hand-over-hand' motion. Better control of actual drilling is one advantage claimed.

See also *Industr Diam Abstr* 1960 Vol 17 p A318 (Dec).

D *Bn Cfb Uqfb*

Interpretation of geophysical borehole logs

L. Marko. *Banyaszati Lapok* 1960 Vol 93 (3) pp 194-207 ; *Hungarian Tech Abstr* 1960 Vol 12 (4) p 131 (Original in Hungarian)

Describes applications of electrical logging and principles underlying the methods used.

D *Az Vfz*

Ocean floor to be drilled in Mohole trials

Anon. *New Scientist* 1961 Vol 9 (217) p 104 (Jan 12)

The American attempt to drill a hole down to the Mohorovicic discontinuity is to be preceded by drilling trials in sea 12,000 ft deep, including the drilling, coring and logging of several holes near Guadalupe Island, off Mexico. Among requirements of the scheme are new techniques for holding still and manoeuvring the ship accurately, facts about drill pipe behaviour in ocean currents, and knowledge of drilling speeds, et cetera. Cores will be recovered from soft rocks by means of a core barrel which can be hauled up on a wire running through the drill pipe. It is hoped to obtain a complete section of oriented cores in soft and hard rocks through about 15,000 ft of strata.

D *Bnt Cfb.1311.342*

Mining 1960—as reported at AMC

Anon. *Engng Min J* 1960 Vol 161 (12) pp 101-105 (Dec)

Among papers given was one by I. Janelid on drilling developments in Sweden. Particular attention has been paid to raising work and good results have been obtained in connection with diamond drilling of up to 170 ft long raises. Other papers convered rock drill repairs and underground drilling techniques. 8 illustr.

D *Bn Cfb Pl.132 Nh.132*

Mining developments in 1960

Anon. *New Scientist* 1961 Vol 9 (217) p 72 (Jan 12) pp 1680-1681, 1719 (Dec 30)

A general survey, including a review of shaft sinking performances in the Union of South Africa.

D *Az Cfb.132.361*

Tapping liquid wealth in our vast north

Glindemann & Kitching Pty Ltd. *'Mindrill' Bits & Pieces* 1960 Vol 13 (9) pp 2, 4 (Nov)

A Mindrill 'G' rig portable rotary boring machine was adapted to handle the tools for combined rotary and 'down the hole' percussion drilling. This diamond drilling rig was devised to solve the problem of drilling the water bores needed to open up the Barkly Tableland north of Mount Isa, Australia. Difficulties involved are described.

D *Cfbf Nh Prb*

From the factory [:] Mindrill F55

Anon. *'Mindrill' Bits & Pieces* 1960 Vol 13 (9) pp 3-4 (Nov)

Gives specifications of this diamond drill designed for medium depth exploration work.

D *Nh.12*

Largest drilling crowns made in S.A.

Huddy Diamond Crown Setting Co (Pty) Ltd, PO Box 4509, Johannesburg; South African Iron & Steel Industrial Corp Ltd. *Diamond News* 1960 Vol 24 (3) p 13 (Dec)

More than 2,400 West African industrial diamonds have been set in large drilling crowns made in South Africa. These crowns were used for exploratory drilling in a recently discovered coal field in the N-W Transvaal Province. They have an od of 12¼ in., can produce 10 in. core, and have been made to a tolerance of plus or minus 1/64th inch.

D *Nhg Qc.361*

WIRE DRAWING

Sintered tungsten carbide dies in the wire industry

E. T. Miller *Wire & Wire Prod* 1960 Vol 35 (12) pp 1668-1670, 1719 (Dec)

D *Cn Pxb*

GRINDING AND POLISHING OF CARBIDES AND METALS

Cut-off grinding or sawing ? Trennschleifen oder Sägen ?

H. Reschenberg. *TZ f prakt Metallbearb* 1960 Vol 54 (12) pp 601-605 (Dec) (In German)

After considering the development of cut-off grinding in the metal working industry, a process already used for a long time in stone cutting, the possibilities of cut-off grinding as a finishing process are outlined. Suggestions on choosing the cut-off wheel, recent investigations into the relationships between cut-off time, wheel wear, and quality of cut, are mentioned, and further developments in the construction and technology of cut-off grinders are discussed. 14 illustr, 24 ref.

A *Pef*

How planning built a modern, efficient barrel finishing department at Shakespeare

M. M. Patterson. *Grinding & Finishing* 1960 Vol 6 (12) pp 26-29 (Dec)

7 illustr. *D* *Chmz*

Why wait ? Ceramics are practical now !

D. H. Joyce. *Carbide Engng* 1960 Vol 12 (12) pp 12-15 (Dec)

Explains how ceramic inserts can be used on machines already capable of using carbide for turning, facing, and boring, and gives examples of performance. Only diamond wheels are used to grind ceramic cutting edges. The wheels should be resinoid bonded and an ample flow of coolant must be maintained. Wheels should not be fed into work at more than 0.001 in./pass as over-feeding will result in damage to a ceramic tool. 4 illustr. *D* *Al Bl Chc Nv/Ceq Pdd Pr*

Brazed carbide tools are not passé

C. R. Christen (Foote-Burt Co). *Carbide Engng* 1960 Vol 12 (12) pp 16-19 (Dec)

States the case for brazed tips as compared with throwaway carbide tips: the former may prove more economical in the long run in some cases. Among reasons for economy in using brazed tip tools is that tool regrinding is easier and cheaper than with throwaway inserts. Details are given of how lower grinding costs can be achieved. After grinding, all tools are honed on the cutting edge, with a consequent improvement in tool life. 4 illustr, 2 tables.

D *Al Bkc Chh/Pdcb*Pdcz*

Grinding beryllium

Anon. *Metalworking Prod* 1961 Vol 105 (2) p 64 (Jan 11)

A short note giving general recommendations.

D *Bfu Chc.21*

BeO at National

National Beryllia Corp. *Ceram Age* 1960 Vol 76 (6) pp 25-26 (Dec)

In order to produce ultra-pure beryllium shapes, free from toxic dust, the company is using specially equipped machine tools in its dust-free plant; these include water-washed diamond grinders in rigid plastic enclosures. The operators work through rubber sleeves and all air from the grinders is exhausted through Cambridge absolute air filters.

E *Bfn Chn Nv Pr.2595*

Modern tool grinders. Neuzeitliche Werkzeugschleifmaschinen

Anon. *Technik u Betrieb* 1961 Vol 13 (1) p 10 (Jan) (In German)

A general article in which various types of machines, among them automatic and electrolytic grinders, are discussed. It is apparent that diamond grinding wheels are widely used in modern machines.

A *Chc Nv Pr/Chc Prs/Chcr Pr*

A Brazilian machine tool plant

P. A. Sidders. *Machinery, Lond* 1961 Vol 98 (2514) pp 116-127 (Jan 18)

Outlines methods and equipment used for lathe production by Maquinas Agricolas Romi SA. The bedways of most lathes are finished by grinding; the Waldrich-Romi slideway grinder used for this operation will have six grinding heads including two with multiple wheels of five elements each when machine design is completed. 14 illustr. *D* *Pr.346*

Wide belt grinding of stainless steel

A. Rakestraw. *Grinding and Finishing* 1960 Vol 6 (12) p 13 (Dec)

The type of abrasive should be aluminium oxide, and the bond preferably resin. Grain size depends on many factors such as the quality of finish desired and the amount of stock to be removed in order to reach the specified limits. *D* *Bfdb Chc Pee*

New development in grinding and polishing industry. Neuerung in der Schleif- und Poliertechnik

H. Petter. *Draht* 1960 Vol 11 (12) pp 802-803 (Dec) (In German)

In large British and American workshops the use of fluid grinding and polishing pastes has reduced production costs by as much as 40 to 60 per cent. The pastes are fed on to the grinding and polishing wheels by means of automatically controlled spray guns. 1 illustr.

K *Ch Rdc*

Production of white-metal-lined camshaft bearings

Duar-Bond Bearing Co, Palo-Alto, Calif. *Machinery, Lond* 1960 Vol 97 (2510) pp 1421-1423 (Dec 21)

Describes an unusual way of producing solid camshaft bearings which results in a dense layer of white metal being cast on the inner surface. Subsequent operations include grinding the periphery of each bearing on a Cincinnati centreless machine to a 0.001 in. tolerance and a finish of 30 to 50 micro-inches. 5 illustr.

D *Ay Bf Chcc Pr*

Turret loader feeds grinder

Norton Co. *Tool & Mfg Engr* 1960 Vol 45 (6) p 57 (Dec)

Workpieces are transferred to and returned from grinding stations by a turret work loader in the Norton transfer machine illustrated. Technique is outlined. 2 illustr.

D *Chc Pr*

Bench model cutter grinder has built-in preset adjustment

New Hermes Engraving Machine Corp, NY 11. *Amer Mach* 1960 Vol 104 (25) p 168 (Dec 12)

The model can grind all engraving cutters used on pantograph machines and all two-lip milling cutters. Construction is said to be such that inexperienced operators can grind cutters concentrically with any desired profile and proper clearance. The cutter can remain in the grinder throughout operations and grinder design allows tipping with the cutter still clamped in the toolhead. All high speed cutters up to ½ in. can be handled, as well as tapered cutters. 1 illustr.

D *Alc Chc Pr*

Comparative appraisal of plane inserted tooth cutters of various designs. Vergleichende Beurteilung von Planmesserköpfen verschiedener Bautypen

H. Haidt. *Industr Anzeig* 1960 Vol 82 (104/105) pp 1781-1784 (Dec 30) (In German)

Sintered carbide cutters require suitable tool grinding machines, and if possible these should be automatic. 12 illustr, 1 table.

K *Al Bkc Chc Prs*

Newall-Keighley type KU 8 universal grinding machine

Keighley Grinders (Machine Tools) Ltd, Keighley, Yorks. *Machinery, Lond* 1960 Vol 97 (2511) pp 1470-1471 (Dec 28)

The machine has a centre height of 5 in. and will grind a maximum length of 20 inches. The wheelhead is mounted on a compound slide and will swivel through 360° ; provision is made for mounting a wheel on either end of the spindle. Wheels up to ¼ in. wide can be used. One feature is the self-contained internal grinding spindle, but the machine may be equipped within air-driven spindle. 1 illustr.

D *Chc Pr*

Dowding & Doll machine tool demonstration

Dowding & Doll Ltd, London W 14. *Machinery, Lond* 1960 Vol 97 (2511) pp 1487-1490, 1495 (Dec 28)

Among demonstrations described is one of relief turning and grinding equipment for the Menziken type 200 lathe. 6 illustr.

D *Ceqb Pr/Chc Pr*

Precision finishing parts by vibration

G. D. deVere Weston. *Metalworking Prod* 1961 Vol 105 (3) pp 67-68 (Jan 18)

Describes some production-line uses for the vibratory machine process. Special mention is made of the Hockley Chemical Co Lacromatic vibrator. 1 illustr.

D *Chmz Qn*

Sawblade grinding machine. Sägeblatt-Schleifmaschine

Anon. *Industrieblatt* 1960 Vol 60 (12) p 816 (Dec 22) (In German)

This new machine completes the Tempo series, and is suitable for all segmented circular saws, solid steel saws with double helical teeth, and cut off circular saws. The grinding spindle runs on high precision ball bearings, and for circular saws mounted with sintered carbide the machine can be fitted with a wet grinding device in connection with a diamond grinding wheel. 1 illustr.

A *Alf Chc Nv Pr*

' Adjustable-V ' outboard work supports

Livingston Tool & Development Co, Belmont, Calif. *Machinery, NY* 1961 Vol 67 (5) p 198 (Jan)

Tru-Grind supports are said to be suitable for all makes, types, sizes, and models of centreless grinders ; they are available for the through-feed and spot grinding of all kinds and lengths of materials. 1 illustr.

E *Chc Pr Psz*

B & S No 510 surface grinder

Anon. *Metalworking Prod* 1961 Vol 105 (3) p 75 (Jan 18)

Work up to 11 in. long, 5 in. wide, and 12 in. high can be ground with an 8 in. diameter wheel on the B & S No 510 surface grinding machine. Additional equipment available includes attachments for wet grinding, wheel truing, and high speed grinding with 15,000 rev-min or 18,000 rev/min spindle. 1 illustr.

D *Chcm Pr Psc*

Scherrer lathe- and planer-tool grinder

Dowding & Doll Ltd, 346 Kensington High St, London W 14. *Machinery, Lond* 1960 Vol 97 (2509) p 1369 (Dec 14)

The HMS 20-80 machine is designed for rapidly grinding clearance angles on lathe and planer tools up to 2½ in. square section, or 3 × 4 in., if an additional support is provided. Grinding is performed by six large abrasive segments mounted on the face of an 11¾ in. diameter disk which rotates at a surface speed of 2,400 ft/minute. 1 illustr.

E *Al Chc Pr*

Grinding fixture

Harig-Steptool Co, 5757 W Howard St, Chicago 48, Ill. *Tool & Mfg Engr* 1961 Vol 46 (1) p 158 (Jan)

This grinding fixture can be used for cam-relief grinding and drill point sharpening. The same cam is used for right and left-hand operation. It is infinitely adjustable and the number of flutes that can be ground is virtually unlimited. 1 illustr.

D *Chc Psc*

Loading awkwardly-shaped workpieces for centreless grinding

Arthur Scrivener Ltd, Birmingham. *Tooling* 1961 Vol 15 (1) pp 46, 54 (Jan)

To obviate the danger of dropping pieces between the wheels, a combined push-feed rise-and-fall loading attachment is used on a Scrivener No 3 centreless grinder. The design allows the piece to be loaded entirely clear of the wheels in the manner illustrated here by diagrams. 3 illustr.

D *Chcc Pr Pscz*

Using full grinding power increases belt efficiency . . .
H. L. Weisbecker. *Grinding and Finishing* 1960 Vol 6 (12) pp 22-25 (Dec)

Describes a method called 'power programming' for gradually increasing the power as the belt wears on a wide-sheet grinder. Resulting advantages claimed are reduced abrasive costs, more consistent dimensions and surface finish, better use of power, and increased machine output. 3 illustr, 1 table.
D *Chc Pee Pr*

High speed grinding
Anon. *Metalworking Prod* 1961 Vol 105 (3) p 9 (Jan 18)

A Japanese company has developed a 200 W motor for use on high speed grinders which, it claims, is capable of 150,000 rev/minute. The motor was designed particularly for use in grinding precision bearings.
D *Chc Pr Uqfcz*

Fluid power provides automatic grinding processes
Anon. *Compressed Air & Hydraulic* 1960 pp 369-371 (Sep); *Pera Bull* 1960 Vol 13 (12) p 322 (Dec)

Describes the use of fluid power in handling, table traverse, wheel dressing, steadies and other grinding machine functions. *X* *Chc Prx*

Effect on a metal surface of metallographic polishing with diamond paste
H. Klemm. *Werkstoffe u Korrosion* 1960 Vol 11 (8) pp 474-478; *Bull Brit non-ferr Met Ass* 1961 Vol 41 (378) p 44 (Jan) (Original in German)

An etchant was used to determine the depth of the Beilby layer on steel polished with diamond dust.
D *Bfd Chm Kmg*

Barrel grinding and polishing. Das Scheifen und Polieren in Trommeln
W. Ullrich, H. Pimishofer. *Fertigungstechnik u Betr, Berl* 1960 Vol 10 (12) pp 728-731 (Dec) (In German)

A clear and comprehensive article dealing with the principles of this finishing method and setting out both its advantages and limitations. 7 illustr, 3 ref, 1 table.
A *Az Chc.21/Az Chm.21*

On the strength of grinding wheels
A. Hornung. *Gep* 1960 Vol 12 (5) pp 184-186; *Hungarian Tech Abstr* 1960 Vol 12 (4) p 152 (Original in Hungarian)
D *Pe Unl*

Honing holes in hardened pinion gears instead of grinding
N. I. Goraetskii. *Avt prom* 1960 (8) pp 30-32; *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (8) p 2594 (Nov) (Original in Russian)
D *Ad Chc*Ad Chh*

Grinding and lapping hard alloy cutting tools with diamond grinding wheels
B. S. Korshunov. *Avt prom* 1960 (6) pp 36-41 (June); *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (8) p 2554 (Nov) (Original in Russian)
D *Al Bfxz Chc Nv/Al Bfxz Chd Nv*

Grinder control unit
Federal Products Corp, Providence, RI. *Tooling & Prod* 1961 Vol 26 (10) p 140 (Jan)

This transistorized dimensional control unit for grinders, it is claimed, can be used with various gauge tooling to provide automatic control of plunge cut and internal grinding. 1 illustr.
E *Chc Pr Wp*

Introducing profile grinding
Anon. *Biul tekh ekon inform* 1960 (6) pp 70-71; *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (8) p 2594 (Nov) (Original in Russian)
D *Chch*

Attachment for machining spherical surfaces
T. S. Sil'chenko. *Machines & Tooling* 1960 Vol 31 (9) pp 40-41 (Original in Russian)
3 illustr. *D* *Az Ceq Psc*

Automatic control of the accuracy of dimensions in internal grinding
Hua Ch'ang-ken. *Izm tekh* 1960 (9) pp 7-10 (Sep); *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (9) p 2889 (Dec) (Original in Russian)
E *Chcn Pr*

Method of multi-start thread grinding
A. F. Chistop'yan. *Machines & Tooling* 1960 Vol 31 (8) p 42 (Original in Russian)

The method described can be used if it is necessary to grind multi-start threads on thread rolling dies on an ordinary production machine. 1 illustr.
D *Axz Chcpz*

How they put precision into the Leica
M. Conklin. *Canad Mach* 1960 Vol 71 (12) pp 112-114 (Dec)

Diamond tools are used in some of the precision operations described. Polishing of surfaces to produce a surface is avoided, as often as possible, since polishing changes sizes and is expensive. Instead, parts are machined by diamond tools. Lens blanks are ground to spherical form by an annular diamond wheel; technique is described. 8 illustr.
D *Bm Chct Nv*

What are the grinding characteristics of tool steels ?
J. A. Mueller (Carborundum Co). *Grinding & Finishing* 1960 Vol 6 (12) pp 30-32 (Dec)

Different tool steels must be ground by different methods, and general specifications are given here as a guide. Tool steels are classified and the conditions of the grinding operation outlined. It has recently been found that diamond wheels can be used economically to grind high vanadium steels as they readily remove steel and generate adequate finish. Grinding should be done wet and normal practice with diamond wheels followed. 1 illustr.
D *Bfd Chc Nv/Bfd Chc.1456*

What do your diamond wheels cost ? Man-made and natural
Anon. *Grinding & Finishing* 1960 Vol 6 (12) pp 35-38 (Dec)

Test results on natural and synthetic diamond wheels are intended to provide data for those who are unable to check diamond wheel results; the data might also be of use in comparing other methods with the use of diamond wheels. 3 illustr, 5 tables.
D *Nv*Nvh/Nv.252*Nvh.252*

Hobbing hardened gears
Yu. I. Retivykh. *Machines & Tooling* 1960 Vol 31 (8) pp 24-27 (Original in Russian)

Grinding is the most frequently used process for final machining of hardened gears but because of certain disadvantages outlined here, the possibility of substituting hobbing for grinding, for gears with a hardness of RC 56 and higher, has been investigated. Experimental technique is explained and results are summarized. 12 illustr. *D* *Ad Cfq*

Automatised electric drive for grinders with consecutive feed

A. A. Sirotin, V. A. Eliseev. *Elektrioestvo* (Moscow) 1960 Vol 7 pp 15-19; *Inhaltsverzeichnisse sowjet Fachzeits* 1960 Vol 9 (10) p 871 (Oct) (In German, original in Russian)

With this system the given tolerance of the workpiece is compared with the ground tolerance and the difference gives the desired value for the feed speed, and grinding is carried out with maximal feed and constant power from the grinding wheel motor.

K *Chc Prd Uqfc*

Female centre with carbide insert

L. N. Speranskii. *Machines & Tooling* 1960 Vol 31 (8) p 41 (Original in Russian)

Female centres made from high carbon steels are used for grinding components between centres when it is impossible to provide centre holes or bosses with centre holes. These centres may wear rapidly and thus reduce accuracy making it advisable to employ centres with a carbide insert of the type used in wire drawing dies. The adapted centre can also be used for grinding components with centre bosses. 2 illustr.

D *Alz Bkc Psz Rwz Unr/Chc Pr Psz*

Increasing the productivity of lapping metals with loose abrasives

P. D. Dudko. *Vest Mash* 1960 Vol 40 (6) pp 71-74 (June); *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (8) p 2594 (Nov) (Original in Russian)

D *Bf Chd Rdb.1452*

Automation of inspection in mechanical engineering

E. R. Dvoretskii. *Machines & Tooling* 1960 Vol 31 (8) pp 2-5 (Original in Russian)

Assesses the present and probable future state of automatic inspection in Russia, mentioning several devices for automatic sizing for various inspection jobs. Existing grinding machines are seldom designed to receive and carry out commands issued by automatic sizing devices so that the few such systems available for centre and horizontal grinders are rarely utilized. More use is made of visual inspectors, which often have dial indicators. Diagrams show application of various systems. 13 illustr. *D* *Chc Pr Qd.133*

Automatic fine grinding machine. Feinschleifautomat

Anon. *MaschMark/Werkzeugmasch-Praxis* 1960 Vol 66 (21) pp 67-68 (Nov 4) (In German)

This electronically-controlled machine has a wide range of uses. Ceramic and sintered carbide grinding wheels of 75 or 70 mm diameter can be used and a device can be added which turns the workpiece over automatically. 1 illustr. *A* *Chcw Prs*

[The Wendt sintered carbide chip breaker grinder]

Fritz Wendt KG, Duesseldorf. *MaschMark/Werkzeugmasch-Praxis* Vol 66 (21) pp 88-89 (Nov 4) (In German)

This machine uses a diamond cup-grinding wheel instead of the usual peripheral grinding wheel. An important feature is the connection of the precision feeding device with the transverse movement of the table, producing relative movement, which helps to give even wheel wear. 1 illustr.

A *Al Chc Nvf Pr*

[Linsinger grinding and lapping machine]

Ernst Linsinger, Steyermuehl, Austria. *MaschMark/Werkzeugmasch-Praxis* 1960 Vol 66 (21) p 100 (Nov 4) (In German)

This table model machine is able to use diamond wheels. 1 illustr.

A *Chc Nv Pr/Chd Nv Pr*

Investigating the efficiency of high-speed grinding

S. N. Korchak. *Vest Mash* 1960 Vol 40 (9) pp 62-65 (Sep); *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (9) p 2889 (Dec) (Original in Russian)

E *Chcz Uqe*

Centreless grinding of drills

V. I. Levin, K. E. Galahova. *Mashinostroitel'* 1960 (8) p 30 (Aug); *Library of Congress Mthly Index Russ Access* 1960 Vol 13 (9) p 2889 (Dec) (Original in Russian)

E *Alb Chcc*

Controlled vibration key to parts-finishing efficiency

T. W. Black. *Tool & Mfg Engr* 1961 Vol 46 (1) pp 77-79 (Jan)

Explains the vibratory barrel finishing process, giving examples of applications and capabilities. 5 illustr.

D *Chmz Qn.1456*

Wear of cutting tools. Verschleiss von Schnittwerkzeugen

G. Nygren. *Werkst u Betr* 1960 Vol 93 (12) pp 777-781 (Dec) (In German)

11 illustr, 2 ref. *A* *Pd Unr*

Surface grinder

H. G. Stevens Co Ltd, 16 Coverdale Rd, London NW 2. *Mach Lloyd* 1961 Vol 33 (2A) p 37 (Jan 28)

A small hand-operated surface grinder has been developed to handle workpieces with diameters up to 7¼ in. and areas of 6 in. × 12 in. and 4 in. × 16 inches. Larger areas can be ground if a reciprocating table is used in conjunction with the machine. Accessories include a quick-action dressing attachment which makes it unnecessary to alter the machine setting when dressing the grinding wheel. 1 illustr.

D *Chcm Pr Psf*

Various spiral drill grinders. Vielfalt der Spiralbohrer-Schleifmaschinen

Anon. *Technica* 1960 Vol 9 (26) pp 1653-1654 (Dec 16) (In German)

According to American statistics, 90% of all broken or prematurely worn spiral drills are the result of bad or faulty grinding. The article discusses various grinders specially suitable for this job, including the SM 3 miniature drill grinder which is equipped with a special automatic truing device by which the wheel is trued according to the setting of the diamond. 7 illustr.

K *Albz Chc Pr Psf:Njb*

Tape control and electronic gaging simplify cylindrical grinding

Anon. *Tool & Mfg Engr* 1961 Vol 46 (1) p 90 (Jan)

Virtually all machine functions including in-process inspection are tape controlled in this Landis grinder. Other functions include wheelhead and worktable positioning. Operator functions are limited to part loading and initiation of the machine cycle. 1 illustr.

D *Chcl Wp*

Grinder/polisher finishes interior of cylindrical parts

Grinding & Polishing Machinery Corp, Indianapolis 5, *Ind. Amer Mach* 1960 Vol 104 (25) p 158 (Dec 12)

Internal surfaces of cylindrical parts can be deburred and polished with accuracy and uniformity with this special machine which features an abrasive sleeve mounted on an expandable rubber mandrel and an adjustable fixture for clamping the part which is mounted on a powered turntable. Through a series of micro-switches, the table rotates when the mandrel is lowered into position. Reciprocal motion of the mandrel permits the use of the full abrasive width, and produces a more uniform finish. 1 illustr.

D *Ag Chcn Prb*

Grinding machine vibration monitor

Stewart Warner Corp, 1826 Diversey Pkwy, Chicago 14, Ill. *Tool & Mfg Engr* 1961 Vol 46 (1) pp 153-154 (Jan)

Sensitive to vibrations as small as 0.000002 in. amplitude, this electronic resonance type vibration monitor can be used to flash a signal or to stop a machine if pre-set limits of vibration are exceeded.

D *Chc Pr Qn Vfd W*

First French Biennale : Sharpening, grinding, polishing, reaming and surfacing machines. Première Biennale française de la machine-outil : Les machines à affûter, meuler, polir, roder et surfacer

Anon. *Machine-Outil Française* 1960 Vol 25 (157) pp 159, 161 (Aug-Sep) (In French)

Describes various machines exhibited, including the Delbore universal precision tool grinders, which can be instantly adapted for all tool grinding, surfacing, and fine grinding operations, and which are characterised by the wheel head which can be orientated to suit any requirements. 5 illustr.

K *Al Chcw Pr*

Modern production processes in metallography. Neuzeitliche Verfahrenstechniken in der Metallographie

W. Strohfeld. *Industrieblatt* 1960 Vol 60 (11) pp 677-683 (Nov 25) (In German)

A detailed article describing the latest metal grinding, polishing and etching processes. A combined process of electrolytic and diamond polishing and the Struers automatic diamond polishing process are mentioned. The new Duiardin single and multiple spindle universal grinding and polishing machine is described ; using resin-bonded corundum wheels, followed by diamond polishing, it is said to give very good results. Automatic diamond polishing is discussed in detail. 12 illustr, 15 ref, 1 table.

A *Chm N.1456*Chmk.1456*

Improved vice table on a grinding machine. Verbesserung des Ausspanntisches an einer Schleifmaschine

Anon. *Die Technik* 1960 Vol 15 (6) p 437 (June) (In German)

A simple device that can be attached to a vice table allows difficult work to be turned over easily and ground precisely on more than one side. 1 illustr.

A *Chc Pr Psd*

Morrisflex grinding indicator

B. O. Morris Ltd, Morrisflex Works, Briton Rd, Coventry. *Mach Shop Mag* 1961 Vol 22 (2) p 92 (Feb)

The purpose of the instrument is to indicate the precise moment at which the grinding wheel makes contact with the work when the wheel is not visible to the operator. It can also be used as an aid to wheel dressing. 1 illustr.

E *Chc Pr Wgz*

Alignment of machine tools by means of spirit levels : yes or no ?

Henri Hauser I td, Bienne, Switzerland. *Microtecnic* 1960 Vol 14 (6) pp 279-281 (Dec) (In English)

For small and medium-size machines, such as iig borers and grinders, mechanical methods based on dial gauges, have not yet been beaten, it is stated. 4 illustr.

E *Az Cfd Pr Wbbj/Az Chc Pr Wbbj*

Honing tool with built-in size control

Delapena & Sons Ltd. *Metalworking Prod* 1960 Vol 104 (52) pp 47-48 (Dec 28)

The sizing mechanism of the Jas-Cal honing tool functions independently of the machine and can be used on any precision built automatic honing machine which has the necessary hydraulic stone expansion system. 3 illustr.

E *Chh Pgk Pr*

Mattison travelling head grinding machine for facing large coil springs

Mattison Machine Works, Rockford, Ill. ; British rep : Gaston E. Marbaix Ltd, Vicarage Crescent, London SW 11. *Machinery, Lond* 1961 Vol 98 (2516) pp 264-265 (Feb 1)

The grinder is a modified version of type 500 UK. The grinding head is mounted on longitudinal ways on a bed member at the rear, and the wheel is rotated in a vertical plane parallel with the direction of traverse. A segmental grinding wheel of between 30 and 36 in. is used. 1 illustr.

E *Az Chc Pr*

Applicator for fluid grinding and polishing paste. Zuführgerät für flüssige Schleif- und Polierpaste

Anon. *Industr Anzeig* 1961 Vol 83 (2) p 34 (Jan 6) (In German)

This semi-automatic device is fixed next to the filter system on the machine, and is said to eliminate loss or wastage of paste. 1 illustr.

A *Pe Rdc:Qz Pscz*

Monarch profile-tracer and variable-spaced lathes

Monarch Machine Tool Co, Sidney, Ohio. *Machinery, NY* 1961 Vol 67 (5) pp 144-145 (Jan)

A major feature is the Monarch super-precision electro-hydraulic tracer, the head of which is built into a bar that is adjustably mounted at the front of the cross slide. Electrical amplification of stylus movement instantly translates the slightest work contour change into hydraulic slide movement. 2 illustr.

E *Ceqb Pr Psr*

Low-cost surface grinder

King Machine & Mfg Co, Los Angeles, Calif. *Machinery, NY* 1961 Vol 67 (5) p 145 (Jan)

Model K-1020 is a low-cost, manually controlled precision surface grinder ; it has a longitudinal table travel of 20 in. and 14 in. cross-feed and can be used for either wet or dry grinding.

E *Chcm Pr*

Deburring gears

Burrows & Smith, Leicester ; Norton Grinding Wheel Co Ltd. *Mach-Tool Rev* 1960 Vol 48 (288) pp 160-161 (Nov-Dec) ; *Machinery, Lond* 1961 Vol 98 (2516) pp 260-261 (Feb 1)

Describes the D-Burr gear deburring machine, claimed to provide a cheap, simple way of removing the heaviest burrs, leaving a pre-calculated chamfer from spur, bevel, and helical gears, sprockets, and from any form which is equispaced around the periphery of a machined blank. An attachment is needed for deburring bevel gears. The principle of operation is to mount a gear on the freely rotating spindle of a swivelling workhead which is lifted until the gear is in contact with a grinding wheel formed like a worm wheel. 4 illustr.

D *Ad Chz Pr*

Morrisflex electronic grinding indicator

B. O. Morris Ltd, Briton Rd, Coventry. *Machinery, Lond* 1961 Vol 98 (2514) p 156 (Jan 18) ; *Metal Treatm* 1961 Vol 28 (184) p 38 (Jan)

The purpose of the instrument is to indicate the moment of contact between grinding wheel and workpiece when this cannot be directly observed, *eg* when the wheel is inside a bore. It is also possible to determine whether the grinding cut is too heavy, or whether there is eccentricity or spring in the workpiece. Cuts as fine as 25 micro-in. can be detected, it is said. The indicator can be used in connection with operations for forming grinding wheels where a large flow of coolant is maintained to protect the truing diamond. 1 illustr.

D *Ab Cg Nj Pscz/Chc Pr Pscz*

An adaptable precision production grinding machine

Anon. *Mach-Tool Rev* 1960 Vol 48 (288) pp 152-154 (Nov-Dec)

This Kellenberger machine is said to have certain exclusive features although external appearance conforms to conventional designs. One feature is the swivelling grinding wheel head which permits not only precision angular setting of the wheel for plunge grinding tapers, but also the selection of one of three grinding spindles for cylindrical grinding, face grinding with the periphery of the wheel, or internal grinding. 4 illustr.

See also *Industr Diam Abstr* 1960 Vol 17 p A165 (July). *D* *Chcw Pr*

Automatic work loading unit for the Churchill type BW cylindrical grinder

Charles Churchill & Co Ltd, Birmingham 25. *Machinery, Lond* 1961 Vol 98 (2513) p 83 (Jan 11)

1 illustr. *D* *Chcl Pr Psc*

Lacromatic Vibrator for deburring and polishing metal parts

British rep : The Hockley Chemical Co Ltd, Birmingham 18. *Machinery, Lond* 1961 Vol 98 (2513) pp 78-79 (Jan 11)

This German-built machine incorporates a U-shaped, rubber-lined container which is oscillated through an elliptical path. The chips and contents move relative to each other and also rotate as a complete mass. Among the various advantages claimed for this arrangement is greatly reduced processing time. 3 illustr.

D *Bf Chm Pr Qn/Bf Chz Pr Qn*

Pipework engineering

S. C. Poulsen. *Machinery, Lond* 1960 Vol 97 (2511) pp 1461-1465 (Dec 28)

Reference is made to special purpose equipment for grinding and counter boring joint flanges, and undercutting holes in condenser plates. 7 illustr.

D *Az Chc.26*

Hard chromium plating of piston rods ? preparation and finishing

Atlas Plating Works Ltd, London W 3. *Machinery, Lond* 1960 Vol 97 (2511) pp 1466-1467 (Dec 28)

Before and after plating, the rods are polished on a centreless machine but very fine glazing belts are also used after plating. Work surfaces of 5 to 10 micro-in. are obtained regularly and higher finishes are said to be possible under special conditions.

D *Agz Chm Pee*

Ellipti-Bur deburring tool

Nobur Mfg Co, N Hollywood, Calif. *Machinery, NY* 1960 Vol 67 (4) p 212 (Dec)

This tool has been developed especially for applications involving irregular hole surfaces like those obtained by drilling into a cylindrical surface or an angular plane. It automatically follows the hole configuration and produces a chamfer of relative uniformity and symmetry. Neither jigs, fixtures, or skilled operators are required to use the tool, it is stated. 1 illustr. *D* *Ag Cfb Pd*

Cutter grinding at Springfield Armory

Springfield Armory, Mass. *Machinery, NY* 1960 Vol 67 (4) pp 146-148 (Dec)

Among operations required is the regrinding of a standard Woodruff key cutter into a form cutter having alternate teeth chamfer and the remaining teeth made square. Precision must be combined with rapid production. 6 illustr. *D* *Al Chc Pr*

USP 2,932,131 (Apr 14, 1958) **C. B. de Vlieg, De Vlieg Machine Co**

Tool grinder

The machine is intended to grind single point cutting tools of hard material, carbides, diamonds, et cetera. Tool grinders as designed hitherto presented certain

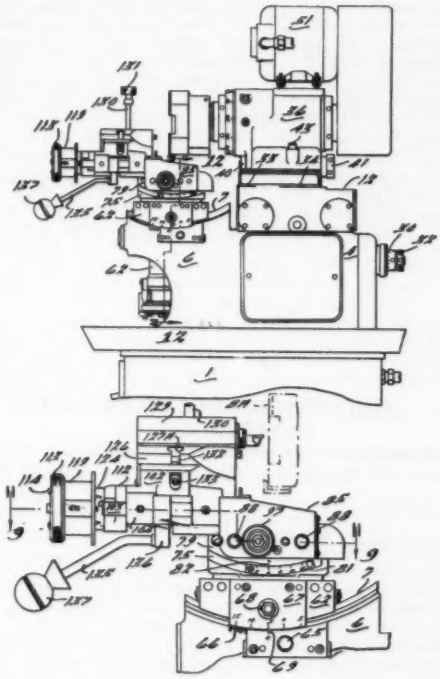


Fig 25 (top) and 26 (bottom). USP 2,932,131

difficulties for maintaining accuracy and for grinding more complex configurations with any degree of convenience ; in fact their range was rather limited. Furthermore tool life and finish could be improved. In the described grinder all dimensions and angular characteristics are pre-set by mechanical means, scales and dials, no templates being required. The wheel is oscillated across the width of the portion of the tool being ground and the tools formed are interchangeable and no re-gauging is required when resetting the ground tools in the machine tools to which they belong. Fig 25 is an elevational view of a portion of the grinder and Fig 26 an enlarged view of a portion of Fig 25 with a grinding block and cutting tool. The grinder rests on a stand 1 and has a control panel with switches, et cetera. The tool carrying structure is supported on arcuate surfaces 7 under grinding face 8A. Table 12 can be reciprocated continuously to move face 8A across the cutting tool preventing excessive wear of individual wheel portions. 102 is the feed slide to advance the tool towards the wheel face. Lever 135 pivots the tool about the axis of the work spindle between adjustable limits and there are a great number of adjustments *eg* end or side cutting relief angles, *etc* which enable automatic grinding of arcuate cutting edges. (12 claims, 13 illustr). Ref cited : 2 USP.

J *Al Chc Pr.545*

BP 835,816 **Crane Packing Co**
(Sep 24, 1956—conv date, USA)

Method and apparatus for lapping

There are two basic automatic lapping methods of shoulders spaced from the opposite ends of the object. Either the lap surface is provided with a central axial opening which receives the protruding end or the lap is formed with an annular groove with the shoulder to be lapped resting on the edge of the groove. In the first method, BP 672,527, grooving of the lap makes it necessary to remove and refinish the lap surface in frequent intervals. In the second method, BP 652,666, lap surfaces of large diameter are required for larger objects and those are expensive. The new method combines the advantageous features of both without their drawbacks. An annular lap surface is associated with a single lap plate which continuously trues one side of an annular lap while the opposite side is lapping a shouldered article. A small diameter, lap plate may thus be employed while no time is lost in dismantling and refinishing operations. (14 claims, 5 illustr).

J *Chd Pr.545*

MACHINING PROCESSES AND DEVELOPMENTS

Breakthrough in electrochemical machining

Curran. *Tooling & Prod* 1960 Vol 26 (9) pp 47-48 (Dec)
2 illustr. *D* *Ceqz.132*

Tools at work

Anon. *Tool & Mfg Engr* 1960 Vol 45 (6) pp 72-74 (Dec)

Long narrow holes in molybdenum are said to be drilled with high accuracy by using a special rig and Elox electrical discharge equipment. A 0.127 in. diameter hole was cut through a 20 in. probe at about 1 in./h from opposite ends of the piece, meeting in the middle. Technique is explained. Other operations are described. 5 illustr. *D* *Cfbz*

Practical and economic problems of machining cavities by spark-erosion

W. Ullmann, T. G. Traube. *Metal Treatm* 1960 Vol 27 (183) pp 493-501 (Dec)
22 illustr, 2 tables. *D* *Az Ceqmb.21*

Chemically polishing plate glass. Flachglas chemisch poliert

Anon. *Glas-Email-Keramo-Technik* 1960 Vol 11 (12) p 468 (Dec) (In German)

Experiments have been made in America with some success and it is hoped that in the coming year the process may be applied to production.

K *Bmb Chmz*

The application of spark erosion in the machining of small metal components. Ein Beitrag zur Anwendung der Funkererosion bei der Fertigung kleiner metallischer Bauteile

W. Wendrich. *FeinwTech* 1960 Vol 64 (12) pp 427-430 (Dec) (In German)

Spark erosion is suitable for machining metals. Since the tool and workpiece are slightly separated from each other in spark erosion, mechanical forces do not come into play, as in turning, milling or boring. Small, parameters are given. 12 illustr, 4 ref.

K *Bf Ceqmb*

Here's a new approach to turning with carbide inserts

A. Incardona, H. H. Poett. *Mach Tool Blue Bk* 1960 Vol 55 (12) pp 97-102 (Dec)

A chart by lathe operators for use as a visual aid is said to replace previous data on turning with carbides. Speeds and feeds are compiled for average work on medium sized lathes, and results from usage of the chart are said to give good surface finish and good tool life. 1 illustr, 1 table.

D *Ceqb Pdcb Pr*

Electrodeposition (Survey for 1959)

R. Pinner. *Reports on the Progress of Applied Chemistry* (Soc Chem Ind) 1959 Vol 44 pp 446-454; *Bull Brit nonferr Met* 1960 Vol 40 (377) p 612 (Dec)

A survey of the 1959 literature covering electrolytic, chemical, and mechanical polishing.

D *Chm.2231/Chmk.2231/Chmz.2231/Chpb.2231*

After the Chicago Exposition. Après l'exposition de Chicago

P. Salmon. *Mach Mod* 1960 Vol 54 (621) pp 15-18 (Dec) (In French)

Trends in the machine tool industry apparent from the exhibition are discussed. The novelties in machining processes, carbide tools, spark erosion, ultrasonic and electrolytic machining are considered to be of limited importance and application so far. 5 illustr.

K *Pr.132.27*

Practical application of electro-erosion in the manufacture of tools and mass-production of machine parts. Applicazione pratica della elettroerosione per la fabbricazione di utensili e parti di serie

F. Benden. *Macchine* 1960 Vol 15 (12) pp 1097-1107 (Dec) (In Italian)
30 illustr.

M *Ceqn Pd Qc/Ceqn Ps Qc.142*

Improving diamond wheel performance—in electrolytic machining

R. R. Brandi. *Tool & Mfg Engr* 1961 Vol 46 (1) pp 80-82 (Jan)

Although diamonds do little or none of the actual cutting in electrolytic machining, selecting the correct type of wheel and preparing and maintaining it properly contributes to general efficiency of the process. Advice is given on the subject. 5 illustr.

D *Ceqh Nv Uqe*

While carbide tool use increased, tool room grinding cost decreased

Timken Roller Bearing Co, Canton, Ohio. *Grinding & Finishing* 1960 Vol 6 (12) pp 40-41 (Dec)

Increased use of carbide tools by automatic screw machine departments has not meant higher tool room grinding costs, since electrolytic grinding methods allow complete tool grinding in one set-up and reduced wheel usage from 7 to 1. An Anocut 300 amp unit is combined with a Porter-McLeod cut off machine and a 6 × 18 Norton surface grinder. Chipbreaker grinding on the latter is described. The metal bonded diamond grinding wheel is 3/16 in. wide, 8 in. diameter. Since only one side of the wheel can be used at a time, a reversible adaptor is used so that both sides can be utilized before wheel dressing is needed. Results are compared with those achieved before the introduction of the electrolytic process. Cutting off with the Porter-McLeod machine is also explained, as is rough and finish grinding of carbide tipped tools with a second Anocut power unit in conjunction with a Hammond oscillating carbide tool grinder. 3 illustr.

D *Al Bk Chcr Nv.252*

Gear cutting by electro-machining. L'électro-usinage des engrenages

J. Bergère. *Machine-Outil Française* 1960 Vol 25 (157) pp 265, 267, 269, 271, 273, 275, 277, 279, 281 (Aug-Sep) (In French)

It has been found that gear teeth submitted to electro-polishing processes retain the original shape given by the initial machining. The article describes the application of electro-machining to gear teeth of special improved shape. This process can in fact improve the performance of certain mechanisms by a slight modification of the shape of their components. 22 illustr.

K *Ad Chmk*

How to apply ballizing . . . for sizing and finishing holes

Anon. *Metalworking Prod* 1961 Vol 105 (2) pp 59-62 (Jan 11)

Ballizing, described as a fast low cost process for sizing and finishing holes in metals, consists of pressing a suitably oversize precision ball through the unfinished hole. Although only the simplest tooling is needed the process must be properly understood for successful application. Ballizing works by a burnishing action which refines the surface structure and leaves a layer of denser metal. It can be used successfully for holes ranging from 0.020 to 5 in. diameter. Conditions of performance and limitations are explained. 2 illustr, 2 tables.

D *Az Bf Chmz*

Electroshaping

Anon. *Metal Ind, Lond* 1961 Vol 98 (4) pp 63-65 (Jan 27)

Describes an electrolytic process for rapid forming of hard and difficult-to-machine materials such as tungsten, molybdenum, and the sintered carbides. There is said to be no need for preliminary roughing, all electro-shaping being essentially finishing operations. Best finishes and accuracies are claimed to be obtained at the highest metal removal rates. Among possible operations are internal shaping, the electrolytic counterpart of internal grinding, and a technique, similar in effect to milling or grinding, which can be used to obtain accurate surfaces, slots or grooves. 9 illustr.

D *Ba Chmk.1456*

Electro-chemical machining

Anon. *Mach Shop Mag* 1961 Vol 22 (2) pp 76-81 (Feb)

Using the same principles as electrolytic polishing and grinding, electro-chemical machining has so far been used mainly for the machining of difficult metals, components of a geometry that makes them difficult to machine, and fragile or delicate components that are easily distorted under normal metal cutting pressures. It is claimed that hard workpieces can be machined and left with a good finish ; as no heat is generated there is no danger of loss of hardness in the case of hardened steel ; metal removal rates are 0.05 to 0.01 cu. in./minute. 8 illustr.

E *Ceqp.1456*

Electro-mechanical sawing

V. I. Kurchenko. *Machines & Tooling* 1960 Vol 31 (8) pp 39-40 (Original in Russian)

Describes design of a machine for electro-mechanical disk sawing, which is said to offer a number of advantages over existing machines. 3 illustr.

D *Cejz*

Automation in motors calls for much re-thinking

F. Griffiths. *Electronics and Automation, Financial Times Survey* 1961 p 37 (Jan 23)

Lack of stresses in the spark erosion process as against the very heavy stresses in grinding processes, will make automation so much easier, it is stated.

E *Ceqmb Unq*Chc Unq*

Spark capacity and work results in metalworking by Spark erosion. Funkenleistung und Bearbeitungsergebnis bei der funkenerosiven Metallbearbeitung

G. Stute. *Industr Anzeig* 1961 Vol 83 (2) pp 19-24 (Jan 6) (In German)

5 illustr.

A *Bf Ceqmb*

Revolutionary new machining process

Metachemical Processes, Crawley. *Financial Times* 1961 (22288) p 13 (Jan 12)

Describes a new electro-chemical process that will in time be capable of replacing most conventional machining methods, it is claimed. Complete moulds for forging can be produced and all milling, reaming, cutting, turning and drilling can be done.

D *Ceqp.1456*

Mattison-Anocut electrolytic ' grinding ' machine

Mattison Machine Works, Rockford, Ill. ; British rep : Gaston E. Marbaix Ltd, Vicarage Cresent, London SW 11. *Machinery, Lond* 1961 Vol 98 (2516) p 271 (Feb 1)

Carbide tipped blades for milling cutters are being ground electrolytically and it is reported that considerable economies are thus obtained. 0.005 to 0.008 in. of metal is removed at a single pass beneath the 16 in. diameter diamond wheel. As 90% of metal is removed electrolytically, wear on grinding wheels is reduced by 80 per cent. Using 100 grit, the wheels extend for a depth of 1/16 in. into the face. 1 illustr.

E *Alz Bkc Chcr Pr/Alz Bkc Chcw Nv Pr*

Sintered carbide grinder. Hartmetall-Schleifmaschine

Anon. *Industrieblatt* 1960 Vol 60 (12) p 753 (Dec 22) (In German)

The process employed by this machine differs from the spark-erosion process, and is based on the principle of localised and controlled electrolytic removal of the material. A thin film of conductive fluid passes between the special metallic grinding wheel and the workpiece. Workpiece and wheel are connected with the positive or negative pole of a d.c. source, thus forming either the anode or the cathode. The eroded material is removed by the electrolyte and not deposited on the grinding wheel. 1 illustr.

See also *Industr Diam Abstr* 1960 Vol 17 p A104 (Apr).

A *Al Chcr*

Sawing by electro-erosion . . . using a rotating disc as the electrode

Anon. *Metalworking Prod* 1960 Vol 104 (52) pp 57-59 (Dec 28)

Gives details of a range of Czech machines using not only disks but also moving band and wire as the cutting tool. For hard and fragile materials, such as sintered carbides, it is said to be cheaper than using diamond wheels. 5 illustr.

E *Cejz Pr.326*

Electro-erosion machining of metals

A. L. Livshits. *NLL Transl Bull* 1961 Vol 3 (1) p 69 (Jan) (Original in Russian)

Book, 115 pp. Originally published by Mashgiz, Moscow, 1957 ; now available in translation from Butterworths, London. Price 30s.

[Not in library of Industrial Diamond Information Bureau].

D *Bf Ceqmb*

French machines for electro-erosive machining. Les machines françaises travaillant par électro-érosion

C. Guillou. *Machine-Outil Française* 1960 Vol 25 (157) pp 293, 295, 297, 299 (Aug-Sep) (In French)

Specifications are given of machines produced by SEPIG, Languepin, Qualitex-Dunod, and Mecano. To be continued. 11 illustr.

K *Ceqn Pr*

Electro-machining beryllium

Anon. *Metalworking Prod* 1961 Vol 105 (4) p 56 (Jan 25)
D *Bfu Ceqh*

Specifications and standards for Eddy current flaw detection in tubing

R. Hochschild. *Non-destr Test* 1960 Vol 18 (6) pp 403-407 (Nov-Dec)

Among ways of artificially simulating natural flaws, one of the most promising is the electrical discharge method. Besides this, filing and drilling, milling, scribing, gouging and chemical etching are used. 4 illustr.
D *Agm Cz.2591:.255*

Ultrasonic welder

Apparecchi Scientifici Federici, Milan. *Mach Lloyd* 1961 Vol 33 (1A) p 39 (Jan 14)

With the appropriate attachments the machine is capable of the following operations: drilling of hard materials such as carbides and ceramics, cold welding, material testing by cavitation, adhesion testing and ultrasonic cleaning. 1 illustr.
D *Cfb Pr Vwghb*

Electrochemistry machines A-286

W. W. King. *Amer Mach* 1960 Vol 104 (26) pp 61-62 (Dec 26)

A new Anocut cavity sinking machine, working on the electrolytic principle, solved the problem of machining bluckets made of A-286 superalloy. The problems involved and equipment used are described. 2 illustr.
D *Ceqh Pr*

Filtration of spark-erosion dielectric

Stream-Line Ltd. *Metalworking Prod* 1961 Vol 105 (3) p 83 (Jan 18)

Performance of spark-erosion machines depends on the absolute cleanliness of the dielectric liquid in which the metal is eroded. A filtration unit is described which is claimed to ensure the complete removal of all the eroded particles. The unit incorporates a Stream-Line filter which works on the principle of edge filtration, and it is arranged so that filtration can be continuous or in batches.
D *Ceqmb Pwc*

Electrolytic polishing of aluminium and aluminium alloys for metallographic purposes with the 'Elypovist'

F. Rämmele, K. Veit. *Jena Rev* 1960 Vol 5 (6) pp 225-226 (In English)

7 illustr, 4 ref.
D *Bfg Chmk/Bfxc Chmk*

Swivel base adds flexibility to grinder vise

A. J. Chevrette (GEC). *Amer Mach* 1960 Vol 104 (25) p 140 (Dec 12)

Describes rebuilding of the vice which enabled more efficient use to be made of an electrolytic chip breaker grinder in grinding two chipbreakers on the same plane, but at 90° to each other and blending at the cutting corner of the tool. 1 illustr.
D *Chcr Pr Pshz*

BP 833,642 **Tricotfabriken J. Schiesser AG**
(Mar 8, Dec 13, 1955—conv date, Germany)

Nozzles for the extrusion of filament-forming or other materials

The nozzles are primarily intended for the extrusion of textile fibres but may also be suitable for extruding hard materials like glass, enamel, and metal in molten state. The nozzle has at least one sleevelike passage along which filament-forming or other material can be passed to an extrusion orifice in which an internal nozzle tube is arranged with an axial passage for a fluid *eg* a gas or a non filament-forming liquid to fill a filament as it is spun. Or a composite filament may be extruded comprising a solid core and a sheath. The nozzle may be produced by electrolytic deposition of a cylindrical metal core with radial recesses which is later removed. Further deposits may then be made. The core can be formed with surface layers of hard material by electro-deposition *eg* of iridium in stages interrupted by polishing and consolidating stages. During manufacture a diamond cutting tool is employed when cutting the nozzle on a precision lathe. During electro-deposition of hard layers it is advantageous to interrupt the procedure and consolidate the formed layer by corundum or diamond dust and polish it to obtain a bright lustre. (18 claims, 35 illustr).
J *Qc Tz.545*

Swiss P 344,954 (Jan 30, 1956) **W. Bloesch**

Method of making a dial and dial made by this method. Verfahren zur Herstellung eines Zifferblattes und nach dem Verfahren hergestelites Zifferblatt

A negative is produced from synthetic plastic material on which a metal film is deposited to obtain a conductive support for electro-deposition of a metal layer. Previously a reinforcement was necessary to separate metal film and layer from the plastic negative. The new method works without reinforcement. The negative is produced by means of a positive mould and it is immediately separated after electro-deposition of the layer. Thus expensive polishing of the base of each dial and diamond polishing of relief numbers and facetting of indices can be dispensed with. (2 claims, 11 illustr).
J *Az Bp Chps.545*

Swiss P 345,092 **E. H. Carman, Birmingham Small Arms Co Ltd**
(July 12, 1956—conv date, Gt Britain)

Method of machining a workpiece by electric sparks and machine for carrying it out. Procédé d'usinage d'une pièce par étincelles électriques et machine pour sa mise en oeuvre

The method is characterised by causing the workpiece to be drilled to vibrate in the direction of the axis of the drill in such a manner that it comes periodically into contact with the electrode. The electrode is mounted in a movable device permitting the electrode to rebound, the inertia of the device being substantially higher than that of the electrode while the latter is constantly urged towards the hole to be drilled. For maximum effect amplitude and frequency have to be controlled. A hollow electrode may be employed through which the electrolytic liquid is directed towards the workpiece. (2 claims, 16 illustr).
J *Ceqm Pr.545*

Swiss P 345,400 **J. L. Adcock, Wickman Ltd**
(Dec 5, 1956 ; Nov 21, 1957—conv date, Gt Britain)

Method of drilling a hole of small diameter by means of electric sparks. Procédé pour le forage, au moyen d'étincelles électriques, d'un trou de petit diamètre

The method is characterised by the use of an electrode of an external diameter of 1.5 mm or more which is so mounted that it cannot vibrate laterally. The electrode is tubular so that a continuous flow of a dielectric liquid can be maintained. The internal diameter may be *eg* 0.1 mm for drilling a hole in hard metal of 1.2 mm diameter using an initial tension of 70 V in an interval between the end of the electrode and the workpiece of 0.05 mm. The voltage is reduced to 30 V after the sparks have started. Pure kerosene is used passing the electrode under a pressure of 5.1 kg/cm² in an uninterrupted flow without vibrations or

pulsations. It is advantageous to support the electrode at a height of 1.5 mm above the face of the workpiece to prevent all lateral vibrations which may increase the diameter of the hole. The channel in the electrode may be eccentric and the electrode rotated to avoid forming of cores in the liquid. It is possible by this method to drill a hole of 8.4 cm length through hard metal. Certain undesirable effects can be eliminated by lengthwise vibration of electrode or workpiece *eg* to reduce the danger of arcing. (7 claims, no illustr).
J *Az Cfbg.545*

FP 1,215,309 **La Soudure Electrique Languepin** (Nov 14, 1958)

Method and device of spark machining workpieces along an edge having a substantially closed contour. Procédé et dispositif de traitment de pièces par étincelles le long d'une arête formant un contour pratiquement fermé

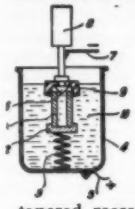
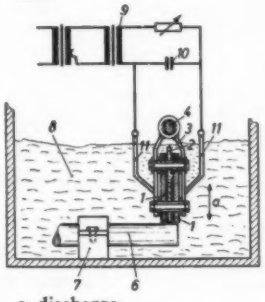


Fig 27. FP 1,215,309.

The principle of the method is explained in Fig 27 where 1 is the workpiece on metal support 2 carried by spring 3 in conductive vessel 4 filled with a dielectric fluid 10. Electrode 6 is conical and connected by 7 to the negative pole of a generator. It is vertically movable towards the workpiece. An insulating plate 9 with a tapered recess holds the electrode over the workpiece so that a spark gap remains. (15 claims, 8 illustr).
J *Ceqm Pf.545*

DAS 1,079,243 (Dec 20, 1958) **P. Buro, Philips Patentverwaltung GmbH**

Apparatus for electro-erosion with several electrodes. Anordnung zur Elektroerosion mit mehreren Elektroden



The manufacture of correctly dimensioned semi-conductor disks by sawing them from rod shaped blanks or bigger plates with very thin saw blades is not satisfactory owing to frequent breakages through twisting of the blades. Electro-erosion can be used instead in an apparatus with several electrodes insulated from one another and with a flowing dielectric. The two poles of a discharge circuit are connected to the several electrodes which are so arranged that the smallest distance between two oppositely connected adjacent electrodes is at least equal, preferable greater than the sum of both spark gaps between electrodes and workpiece. The basic arrangement is shown in Fig 28 and 29. Electrodes 1 are separated by an insulating (mica) layer 2. They are reciprocable on rail 4 across semiconductor blank 6 by a mechanism 5a and also vertically by a mechanism 5b. (9 claims, 9 illustr). Ref cited : 3 DBP ; 1 Swiss P ; 1 USP ; several special publ.
J *Cequ.21.545*

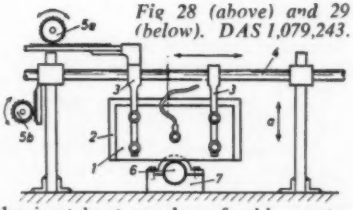


Fig 28 (above) and 29 (below). DAS 1,079,243.

PRODUCTION, GRADING & RECOVERY OF ABRASIVE PARTICLES

What is hardness ?

Anon. *Diamond Data* 1960 Vol 1 (4) pp 3-4 (May)

Research indicates that hardness is an inadequate basis for the evaluation of the comparative abilities of abrasives to grind any work material, nor does hardness provide the whole answer to the efficiency or economy with which required toolroom specifications can be met by different abrasives. Hardness, as indicated by scratch and indentation tests, does not seem to be correlated with strength and toughness properties ; the latter are apparently more closely related to the fundamental structure of the abrasive crystal. The diamond molecule is an ideal strength structure from the engineering viewpoint. 1 table.
D *F Ucd Unl/Rd Unh*Rd Unl*

Perk up profits with coated abrasives

Anon. *Canad Mach* 1960 Vol 71 (12) pp 108-111 (Dec)

Reports latest developments in coated abrasives and types of production equipment available, and gives advice on correct operating techniques. 11 illustr.
D *Ceq Rdg.1456*

Testing the grade of grinding wheels

J. Peklenik. *Microtecnic* 1960 Vol 14 (5) pp 233-238 (Oct) ; (6) pp 258-271 (Dec) (In English ; original in German)

20 illustr, 7 tables, 25 ref.

See also *Industr Diam Abstr* 1960 Vol 17 p A164 (July). *E* *Pe Um.21/Pe Un.21*

Norton abrasive for precision grinding

Norton Co, Worcester, Mass. *Machinery, NY* 1961 Vol 67 (5) p 146 (Jan)

23 Alundum abrasive grain is intended especially for operations like surfacing with abrasive segments. It combines the friable free cutting characteristics of 32 and the durability of 52 Alundum, it is claimed.
E *Chcw Rd*

TOOL PRODUCTION

Straight turning tool with chip breaker

A. F. Kabanov. *Machines & Tooling* 1960 Vol 31 (9) p 42 (Original in Russian)

To ensure safe chip removal when turning steel, straight carbide turning tools having a small groove on the rake face are used. So that the tool can be used over a wide range of cutting conditions with one size of groove, the carbide tip is brazed at a negative cutting edge side rake. The cross section of this tool in a plane perpendicular to the main cutting edge is shown in a diagram and the dimensions of the grooves in relation to the make of steel are given in a table. 1 illustr, 1 table. *D* *Bfd Ceqb Pdc*

Damping offsets ceramic-tool britt'eness

M. Mizuno. *Amer Mach* 1960 Vol 104 (26) pp 63-64 (Dec 26)

2 illustr. *D* *Pdd Qp*

Sintered cutting tools. Oxydische Schneidwerkzeuge
Anon. *Industrieblatt* 1961 Vol 61 (1) p 64 (Jan) (In German)

The high quality and dependability of modern sintered cutting tools is achieved through the use of very pure sintered aluminium oxide, of very small particle size. Degussit cutting tools are mentioned.
A *Pdc Qc*

Fixing ceramic cutting tips with heat and vibration resisting adhesive
A. V. Rudney, V. V. Sokolovskaya. *Machines & Tooling* 1960 Vol 31 (8) pp 37-38 (Original in Russian)
6 illustr, 9 ref. *D* *Pdd Qc*

Comparative tests on ceramic and hardmetal-tipped lathe tools
M. Popov, I. Mitrica, E. Deciu. *Gep* 1960 Vol 12 (5) pp 179-183; *Hungarian Techn Abstr* 1960 Vol 12 (4) p 152 (Original in Hungarian)
D *Ceqb Pdc*Ceqb Pdd*

Chips 0.0001 inch ! !
Microbore Div, De Vlieg Machine Co, Royal Oak, Mich. *Tooling & Prod* 1961 Vol 26 (10) pp 38, 42 (Jan)

Precise finish boring of steels or cast iron, with chips as fine as 0.0001 in., can be obtained by using either ceramic or titanium carbide cutting edges bonded to Microbore tooling system cartridges. It is pointed out that, because of their hardness, the tools should not be sharpened on silicon carbide grinding wheels. For tests they were sharpened on a Mircopoint tool grinder using a 320 resinoid bond diamond wheel and a mist coolant.
E *Al Bl Chc Nv Urb|Bfca Cfdb Pdd|Bfd Cfdb Pdd*

A sound approach to tool costs
C. Weiner. *Tooling & Prod* 1960 Vol 26 (9) pp 45-46 (Dec)

Protreat ultrasonic treatment is said to increase tool life up to eight times on one job. Tools bought in the heat treated condition are given the heat treatment before use, and afterwards are finish ground and put into operation. Treated tools are claimed to cut more metal before the first grind, and to improve with each successive regrind until a peak number of pieces/grind is reached and maintained after the fifth regrind. Various operations with treated tools are described.
D *Pd Uqe Vwghb*

Radius grinding fixture
J. Zuber. *Metalworking Prod* 1960 Vol 104 (49) p 101 (Dec 7)

Describes construction and operation of a fixture in which a tool bit may be ground conveniently to a convex or concave radius. 1 illustr.
D *Al Chc Pr Psc*

Burflex burrs
Burflex Ltd, Brierley Hill, Staffs; Distributors: Alfred Herbert Ltd, Coventry. *Machinery, Lond* 1960 Vol 97 (2508) p 1295 (Dec 7)

A new range of burrs in tungsten carbide, HSS and tool steel, is being produced. The grouped arrangement of the teeth, sometimes called 'section cut' or 'American cut', is used for those shapes in tungsten-carbide where the teeth come to a point. This arrangement is said to result in improved chip clearance from the end of the burr, and improved stock removal. The cylindrical-shaped burrs are end cut. 1 illustr. *D* *Peb*

Clamping hard metals. Les fixations des métaux durs
Anon. *Machine-Outil Franç* 1961 Vol 26 (161) pp 135, 137 (Jan) (In French)

Discusses various methods of clamping ceramic and hard metal cutting tool inserts. 6 illustr.
K *Al Bk Cqz/Al Bl Cqz*

POWDER METALLURGY

Metallurgical progress
L. Sanderson. *Tooling* 1961 Vol 15 (1) pp 38-40 (Jan)

Among recently developed materials mentioned is a new grade of sintered carbide which operates at speed and feed ranges between those of standard carbide grades and ceramic tools. It is made by conventional powder metallurgy techniques and uses titanium carbide and other metallic carbides. It can be brazed to steel shanks and ground by standard methods. The high titanium content is said to give freedom from build-up when machining steel and cutting edge strength is high.

Two new tool steels are also described, one of which has wear resistance excelling that of the high carbon, high chromium steels.

See also *Industr Diam Abstr* 1960 Vol 17 p A263 (Oct). *D* *Rhd*

Progress reported in powder metallurgy
Anon. *Prod Engng* 1961 Vol 32 (4) pp 16-17 (Jan 23)

Mentions a number of advances in techniques for producing powder metallurgy parts. 1 illustr.
D *Vwlb.132*

MISCELLANEOUS

NBS to co-operate in new Institute of Measurement Science
Anon. *Tech News, US Bur Stand* 1960 Vol 44 (12) p 212 (Dec)

The George Washington Univ (Washington, DC) has announced the establishment of an Institute of Measurement Science.
D *Vfd.243.342*

Numerical control of machine tools
K. J. Coppin. *Mach Lloyd* 1961 Vol 33 (1A) pp 21-22 (Jan 14)

Abstract of paper to the British Institution of Radio Engineers.

Economic factors, maintenance, and choice between different systems are among topics covered.
D *Pr Wpz*

The protection of machines against premature wear. Etude sur la protection des machines contre l'usure prématurée
E. Thirion. *L'Usine Belge* 1960 Vol 37 (1707) pp 9-10 (Nov 5) (In French)

Attention is drawn to the need for protection against dusts and the need for careful lubrication; these matters are discussed. *A* *Pr Unr*

The potentialities of accurate measurement and automatic control in production engineering

J. Loxham. *The Prod Engr* 1960 Vol 39 (12) pp 695-724 (Dec)

In an endeavour to show what is considered to be the correct technique for establishing a tolerance and a manufacturing technique which will ensure parts being made well inside the agreed limits, an example used is of a grinder fitted with a controller and grinding gauge. 36 illustr, 3 ref.

E *Chc Pr Wbb/Chc Pr Wp*

What Mo S_2 lubricants do for threads

H. Gerstung. *Canad Mach* 1960 Vol 71 (12) pp 120-124, 127 (Dec)

Assesses molybdenum disulphide as a thread lubricant and describes how it can prevent galling and seizing in threaded assemblies subjected to extreme operation conditions. The two basic characteristics that make it valuable in this application are low coefficient of friction at extreme bearing pressures and broad range of thermal stability. Various forms of the lubricant are distinguished and some of its uses on threaded connections are described. *D* *Tz:Sk*

Machine tools at the Mechanicals : [Institution of Mechanical Engineers]

D. F. Galloway. *Metalworking Prod* 1960 Vol 104 (52) pp 15-16 (Dec 28)

Report of the 1960 James Clayton Lecture at the Institution of Mechanical Engineers on Dec 14.

E *Pr*

PUBLICATIONS RECEIVED

BOOK REVIEWS

Commercial Standard CS217-59 — Grading of abrasive grain on coated abrasive products

Superintendent of Documents, US Govt Printing Office, Washington 25, DC. 40 pp, illustr, tables. Price 15 Cents

This recorded voluntary standard of the trade, published by the US Dept of Commerce, provides uniform methods for recovering the grain from the coated product, and for testing the recovered grain to determine conformity with this standard. The standard also serves as a basis for understanding between buyers and sellers as to particle size.

D *Qw Rdb.255.52*

Vickers hardness test for steel

ISO Recommendation R 81, 1st ed, 1959, 8 pp, Ref No ISO/R81-1959 (E) (Feb) International Organization for Standardization, Switzerland. Price Sw. Fr. 3.75. (In Engl.sh)

D *Bfd Cvd Unhcc.52*

Rockwell hardness test (B and C scales) for steel

ISO Recommendation R 80, 1st ed, 1959, 8 pp, Ref No ISO/R80-1959 (E) (Feb) International Organization for Standardization, Switzerland. Price Sw. Fr. 3.75. (In English)

D *Bfd Cvd Unhcd.52*

Brinell hardness test for steel

ISO Recommendation R 79, 1st ed, 1959 8 pp, Ref No ISO/R79-1959 (E) (Feb) International Organization for Standardization, Switzerland. Price Sw. Fr. 3.75. (In English)

D *Bfd Cvd Unhcb.52*

American Gem Society—Member Suppliers 1960-1961

American Gem Society, Los Angeles 5, Calif. 35 pp, 6 × 9 in., illustr

Includes hints for identifying synthetic stones, and tables of relative hardness, gem properties, and gem size comparison. Ideal proportions for the brilliant cut diamond are shown.

D *Bbb Ccb.57/F Kbb.57*

Under the deep oceans

T. F. Gaskell. Eyre and Spottiswoode, 22 Henrietta St, London WC 2. 1960, 240 pp, illustr. Price £1 5s 0d

In this book Dr Gaskell refutes the theory that the oceans and continents are freely interchangeable and that the land on which we stand was once part of the sea bed. He bases his assumptions on his experiences with oceanographers before the war, as Chief Scientist with the Navy during the war, and with oil geologists. The book gives a survey of the main features of underwater rock structures and the techniques used in obtaining this knowledge but of particular interest is the final chapter which deals with the deep drillings carried out by geologists in search of oil. Also the problem of drilling the Mohole is discussed and the advantage of using diamond drill bits is demonstrated.

E *Bnt Cfb Njb.52*

Exploratory drilling practices and costs at Western Uranium Deposits

D. E. Redmon. US Dept Interior, Bureau of Mines, Information Circular 7944. 1960, 68 pp, illustr. Price 45 Cents

The paper gives results of studies of several drilling methods currently used in the search for uranium deposits in sedimentary formations from surface drill sites. A description of drilling with wire-line equipment from underground in metamorphic rocks is also included. The author does not attempt to draw general conclusions from data on drilling done by different crews under varying conditions, but deals with techniques used to solve specific problems and which might prove useful in solving similar problems elsewhere. Various types of diamond drilling techniques and equipment are assessed.

D *Cfb Nh.12.1456.52/Cfb.12.1456.52*

Program

Tenth Annual Drilling and Blasting Symposium, Colorado School of Mines, Golden, Colorado, Oct 16-19, 1960

Abstracts. of papers are given and include : 'Laboratory and field testing of rotary rock bits' by J. D. Medlock : and 'Drilling beneath the ocean' by W. Bascom.

D *Cfb.541:.52/Cfbr Pl.1312.541:.52*

Friction and lubrication of machine tool slideways [:] Frictional characteristics of P.T.F.E. impregnated bronze sliding on cast iron

PERA Report No 80. 1960, 30 pp, illustr. (Sep). Production Engineering Research Association of Great Britain, Melton Mowbray, Leics.

In the preparation of the slideway surfaces, surface finish records were obtained with a Model 2 Talysurf fitted with a skidless pick-up, the diamond stylus of which was in form of a 90° pyramid with a 0.0001 in. tip radius. The waviness in both longitudinal and transverse directions was measured by traversing the table of the Talysurf past the stationary pick-up head which was fitted with a chatter head having a 0.1 in. diameter stylus.

D *Pr Qr.52/Pr Unq.52*

Grinding and superfinishing. Rectification superfinition

H. H. Ponlet. *Métallurg et Constr Mécan* 1960 Vol 92 (10) p 842 (Oct) (In French)

Book, Pub Eyrolles, 61 Blvd St German, Paris 5e. Price NF 24.34.

This work gives information on materials used, methods of manufacturing grinding wheels, current grinding operations, and accident precautions while superfinishing is given a general treatment. The book is well-documented and illustrated, and is intended for both practising engineers and students.

K *Chc.21.52/Chs.21.52*

General Electric man-made industrial diamonds—a key to industrial progress

Metallurgical Products Dept, General Electric, 11177 E 8 Mile Rd, Detroit 32, Mich. 12 pp, 11 × 8½ in., illustr

The various efforts to make diamonds, culminating in GEC's success in 1955, are outlined. The synthetic diamonds now available for resinoid and vitrified bonds are of controlled uniform structure, shape, and quality are said to cover the full scope of grinding applications of these bonds. Advantages claimed are longer lasting wheels due to rough surfaces and 'optimized friability' of the grit, lower costs/piece, greater output/wheel, freer cutting, and consistent diamond quality. Examples of successful use are quoted.

A section is devoted to GE synthetic diamonds for metal bonded wheels which differ from the other crystals in respects outlined here. Applications vary from glass grinding to conventional grinding of sintered carbides. Predictions are made as to possible future uses of synthetic diamonds.

D *Fh Ha.342.57/Nvh Uq.57*

Yearbook of surface technique 1961. Jahrbuch der Oberflächentechnik 1961

W. Wiederholt (editor); Metall-Verlag GmbH, Berlin-Grunewald. 1961, 17th ed, 1072 pp. Price DM 22.50. (In German)

This 17th edition contains a wide range of original articles, many of them concerned with various grinding and polishing processes. Of particular interest is an article by B. Kleinschmidt on diamond tools in which he discusses natural diamonds and their uses, synthetic diamonds, diamond grinding wheels and lappers. Comprehensive surveys of technical literature, patents, and standards are included, and much useful general information is also to be found.

A *Chc.1456.515/Chm.1456.515/Nv*Nvh.52*

Handbook of technical microscopy. Handbuch der Mikroskopie in der Technik

H. Freund. Umschau Verlag, Frankfurt a.M. 1960, 689 pp, indices, illustr. (In German)

The second part of the first volume of this work deals with the instruments available in this field and consists of a number of papers by specialists. The first contribution by H. Ehrenberg gives a comprehensive survey of the instruments used, the optical principles and the methods used in the microscopic examination of inorganic industrial materials. Of special interest to readers: teh paper on 'The choice of methods of examination and the preparation of samples', which deals in detail with the various methods of grinding surfaces for examination. *K* *Vj.523*

Exploration Drilling: Proceedings of the ninth annual Drilling Symposium, Oct 8 - 10, 1959

H. L. Hartman, College of Mineral Industries, Pennsylvania State Univ, Univ Park, Pa. 126 pp, illustr. Price $3.--

Papers given included: (*i*) 'Wireline coring technique in Western Rhodesia' by D. C. Squirell; (*ii*) 'The magnetically unaffected Craelius Dip Indicator for drill hole surveys' by E. V. Roxstroem; (*iii*) 'Re-assessing the merit of small-diameter drill holes' by P. L. McLaughlin; (*iv*) 'Use of foam-producing agents in drilling' by W. C. Goins jun and H. J. Magner; (*v*) 'Diamond bit design' by E. M. Jenkins; (*vi*) 'AM-9 chemical grout' by L. E. Mack. Many aspects of diamond drilling are covered in the course of the various sessions.

D *Cfb Nh.541:.52/Cfb.541:.52*

TRADE LITERATURE

Collected catalogues

Greif-Werk GmbH, Hagen-Haspe, Westfalen, Germany; British Rep: Roland Goodall Ltd, 19 Station St, Burton-on-Trent

Machines for dry and wet grinding, rough and fine grinding of tool bits and tools, and grinding of twist drills are among models described and specified. Advice is given on operation.

D *Al Chc Pr.57*

Collected catalogues

Mindrill Ltd, 86-106 Plenty Rd, Preston N 18, Victoria, Australia

Mindrill F 25, F 55, and F 65 diamond drills are described and specified.

See also *Industr Diam Abstr* 1960 Vol 17 p A284 (Nov). *D* *Cfb Nh.57*

Churchill model HBM Automatic Sizing Internal Grinding Machine

Churchill Machine Tool Co Ltd, Broadheath, Manchester. 8 pp, 8½ × 10¾ in., illustr

The machine can be operated on a single automatic cycle for plunge grinding as well as on a double automatic cycle with intermediate truing for either traverse or plunge grinding. In either case, sizing is controlled by setting of the truing diamond, the essential difference being that truing in the single cycle occurs just before the wheel enters the bore of the work, whereas in the double cycle truing is between the roughing and finishing stages. Changeover between cycles is stated to be quick and easy. Principles of operation of the automatic feed and of the two cycles are explained. The machine can also be adapted to use as a non-automatic plain internal grinder. Standard equipment includes one spike-shaped truing diamond. Specifications are given. Automatic Facing Equipment, operating in the full machine cycle, can also be supplied. *D* *Nj Psf:Chcn Prs.57*

PATENT LISTS

BRITISH

The Official Journal (Patents) 1960 (3750) (Dec 29)

861,405 NORTON CO. Coated abrasive sheets.

861,434 MICROMATIC HONE CORPORATION. Honing elements.

The Official Journal (Patents) 1961 (3753) (Jan 18)

862,901 CENTRE NATIONALE DE LA RECHERCHE SCIENTIFIQUE. Apparatus for machining by electric spark discharges.

862,902 CENTRE NATIONALE DE LA RECHERCHE SCIENTIFIQUE. Apparatus for machining a workpiece by electric spark discharges.

863,039 HALLEWELL, H. S. Forming means for profile grinding wheels.

862,607 HAMMOND MACHINERY BUILDERS INC. Elevating and traversing mechanism for a grinding machine.

863,113 COMPAGNIE DE SAINT-GOBAIN. Mountings for glass cutting tools.

The Official Journal (Patents) 1961 (3754) (Jan 25)

863,649 WICKMAN LTD. Electro-erosion machines.

UNITED STATES

Official Journal 1960 Vol 761 (1-4) (Dec)

2,962,838 R. W. KEBLER, E. E. DUTCHESS, R. L. HUTCHESON, UNION CARBIDE CORP. Method for making synthetic unicrystalline bodies.

2,962,840 C. H. WERTH, HOERN & DILT DIVISION OF THE BRITISH MACHINE CO. Grinding apparatus.

2,962,890 J. A. REINHARDT, WHEATON ENGINEERING CORP. Lever escapements.

2,963,017 J. W. NAVEL, G. C. JOYCE, NORTON CO. Grinding wheel truing apparatus.

2,963,018 S. A. MATTSON, A. V. KARLSSON, J. NILSSON, SKANDINAVISKA GRANIT AB. Stone-sawing machines.

2,963,829 C. H. WERTH, HOERN & DILTS INC. Grinding machines.

2,963,830 R. P. HOOK, NORTON CO. Lapping machines.

2,963,832 P. OHRINGER, CUTLER-HAMMER INC. Machine tool control.

2,963,900 L. E. KUEBLER, WESTERN ELECTRIC CO INC. Pneumatic flatness gage.

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